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Diamond Dies for Wire Drawing

Information on Hitherto Closely Guarded Operations — How Dies Are Lapped and Tested for Size—Automatic Lapping Machines for This Work

By C. W. BUSICK

THE drilling and polishing of diamond dies is an art which is not generally understood and a wall of secrecy has been thrown around the processes which confine this art to a few craftsmen who will only instruct sons or friends who have their confidence. Even the heads of important wire drawing industries have but little real knowledge of the operations in this department of their works although the cost of their fine wires depends largely upon the service given by the diamond dies through which they are drawn. As the methods used in making and maintaining dies should be of general interest, some details are given herewith.

The diamonds used are borts or flat shapes found in the crude state and so thin or of such poor color as to render them useless as gems or jewels. Some of the borts used are chips obtained when cutting the crude diamond into proper shape to be used by jewelers.

FIG. 1. A SECTION OF DIAMOND DRAWING DIE

These flat shapes are then mounted in a suitable holder to be drilled and polished. Fig. 1 gives an idea of the way the diamond is set in the holder.

The diamond is embedded in the center and the die is placed under a drilling machine driving a blunt bit which revolves in diamond dust. The cutting is done by making "diamond cut diamond," which is doubtless the inspiration for the familiar saying. There is no standard drill for this work but each diamond cutter has his own design specially made for him. These designs are jealously guarded and there is no standardization.

These drilled diamonds must then be polished and shaped, as on this finish depends the quality of the work which the die will do. The proper slope from the sides to the center, the edge through which the wire is drawn and perfect roundness of the opening are all essential to a good die.

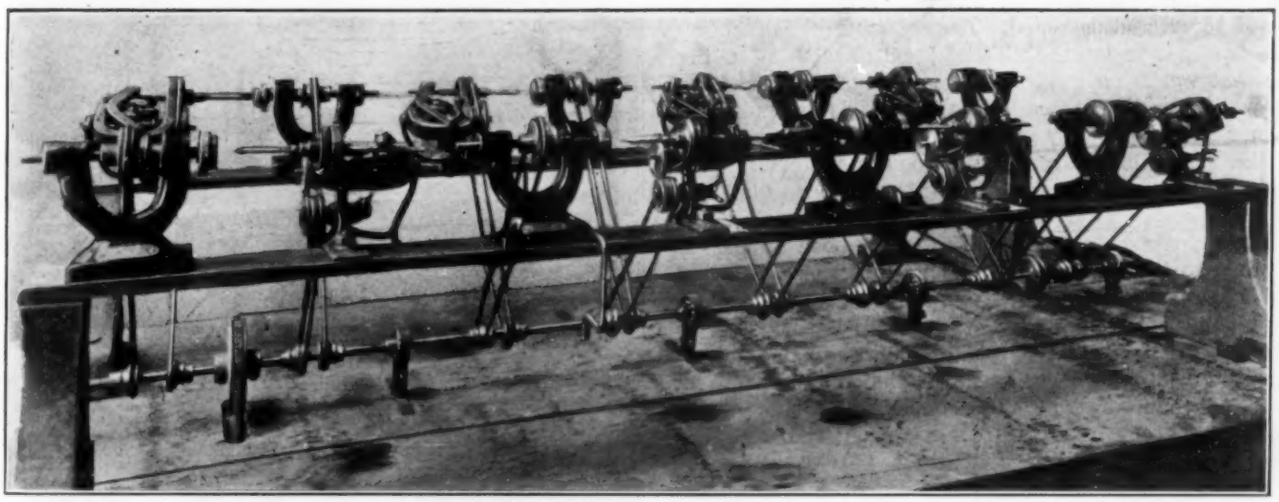


FIG. 2. A BANK OF DIE LAPPING MACHINES

Formerly the polishing was done on small machines which depend principally on hand labor to secure the desired results. This left too much to the judgment of the operator, with the result that many of the dies were not true and so could only be used as breaking down or "ripping" dies. Furthermore, after a die has been in use for some time, the opening will become grooved or roughened so as to draw wire out of round and also cause too much breakage.

Such a die must again be polished to exact shape. This requires great care and is expensive especially in the case where each machine must have its individual operator, as the process is slow and the labor cost high.

The quality of the repolished die is largely dependent upon the individual skill of the operator and many imperfect dies are returned to the user. This has led to the invention of the automatic machine illustrated in this article which insures the perfection of the dies after polishing. All manual work in the operation is done away with and a single operator can look after ten to twelve such machines and keep them running.

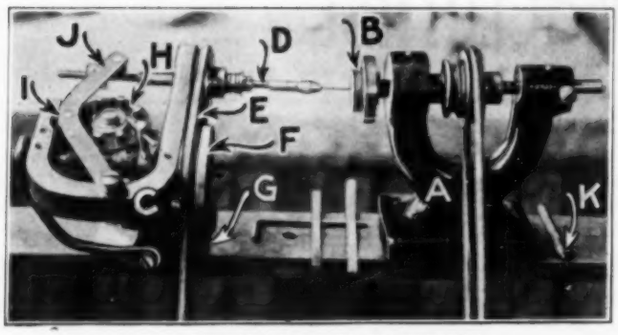


FIG. 3. ONE OF THE MACHINES

As almost all diamond dies break or shatter on one side, the repolishing becomes a matter of lapping out the imperfect hole and rounding the opening to the next larger size so that the die will again draw perfect wire.

If the angles of the approach or throat are not equal, the wire comes in contact with a greater resistance on one side than on the other and the finished product is out of round and flattened. The common method therefore is either to lap the dies by hand or with a lapping bar that works on guides and passes in and out of the die while the die rotates. This method is not mechanical nor is it possible by its use to lap the hole round and at the same time only remove enough material to be able to obtain a perfect radius at the extreme diameter of the hole.

If, for instance, the hole in a die has been pulled out or worn so that it measures 0.0095 in. in one direction and 0.010 in. in the other, it would be 0.0005 in. out of round and must be relapped for the next larger size of wire. As the next size is 0.0102 in., the hole must be enlarged 0.0007 in. in the small dimension and 0.0002 in. in the large one to true it up. In lapping a hole of this size and contour by hand in the ordinary method it is almost an impossibility to obtain a perfect radius or to get it within 0.0001 in. which is considered almost perfection by the average manufacturer. By the use of the lapping machines shown in Figs. 2 and 3, the requirements of some of the best wire manufacturers of high-grade wire can be met and dies can be recut from one size to the next, obtaining a finished product in each case.

It is a well-known fact among machinists that a lapping bar has to pass back and forth through the hole being lapped. In the lapping of diamond dies, however, this does not hold, owing to the fact that the wall of the die is curved and a straight lap would have to go into the hole at an angle and therefore would be under a constant strain, which would cause the lap to drop into the low places in the die. This would have a tendency to cut as much in one place as the other and to keep the hole out of round.

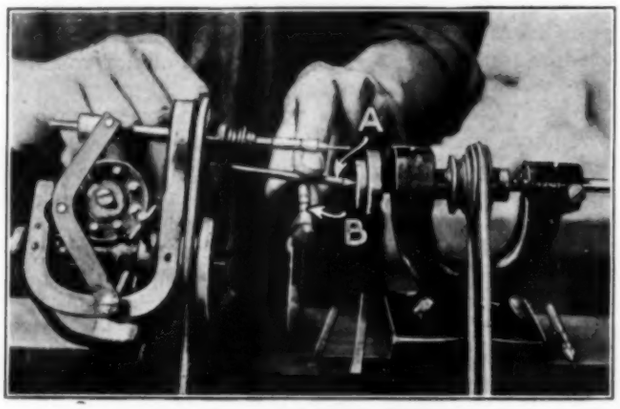


FIG. 4. CENTERING THE DIE

USING NEEDLES FOR LAPS

It has been found that by using the ordinary cambric needle ranging from 0.002 in. to 0.015 in. larger than the hole in the die and running the lapping spindle at an angle of 1½ deg. that a die can be lapped very round and to almost absolute perfection and at the same time dies can be cut or lapped within a margin of from 0.0002 to 0.0003 in. This can hardly be done by hand or with the ordinary polishing machine as any lack of alignment would very quickly cut the lap or needle flat on one side and make it out of round. The only absolute mechanical method is to revolve the lap in one direction and the work in the opposite direction at different speeds and at the same time pass the lap in and out of the hole at about 60 passes per minute making a steady movement so that the lap simply stops and starts back.

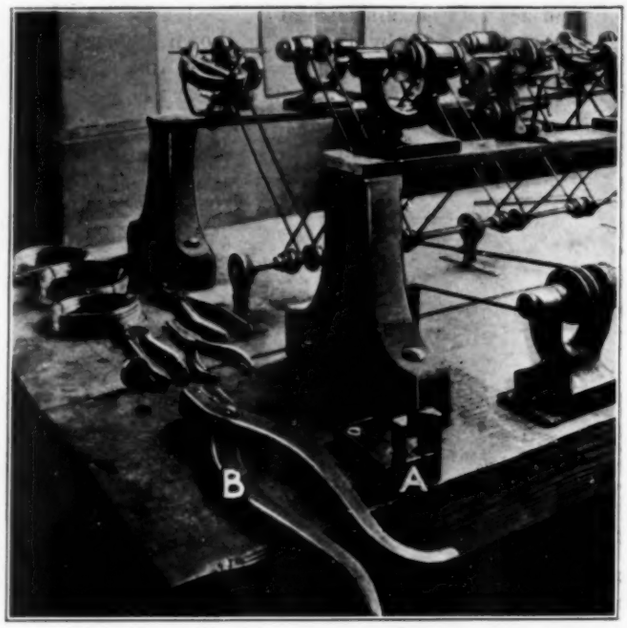


FIG. 5. WHERE THE TEST WIRE IS DRAWN

By this motion the lap cuts a double spiral, one in the opposite direction of the other. The cutting effect is diagonal to both spiral sines and at a right-angle with the hole. With this method it is impossible to cut or leave rings in a die which is very common in the old method and proves to be very unsatisfactory, as the life of the die is apt to be very short and in many cases the die will not draw wire at all. The higher the polish the greater the efficiency and the longer the life of the die. Consequently a greater production is obtained from the die as well as a better quality of wire. It is a common practice to use any die to break down or "rip" as long as it will draw wire, but this is a mistake as a rough, or out-of-round wire, greatly reduces the life of the finishing die and is very apt to give bad results.

A bank of eight automatic lapping machines is shown in Fig. 2 all being driven from a small ball bearing shaft in the center. Each machine consists primarily of the head *A*, Fig. 3, which carries the diamond die at *B* and the lapping head *C* with the spindle at *D*. The spindle is driven by the round belt *E* from the

FIG. 6. MEASURING THE WIRE. FIG. 7. WHERE THE DIES ARE EXAMINED

friction wheel *F* which rests on the wheel *G*. The end or in-and-out motion is secured by the pins in the wheel *H*, which is revolved by the worm shown. These pins contact with the roller *I* on the arm *J* and move the spindle endwise at frequent intervals. The lapping material, diamond dust, is applied to the die by a needle, held in a chuck as shown at *K*. In order not to throw off the lapping material the die and spindle must not run too fast, about 600 r.p.m. for the lapping spindle and 1,800 r.p.m. for the die being good practice, as the die and spindle run in opposite directions the total lapping speed is 2,400 r.p.m.

How the Work is Done

In Fig. 4 the operator is locating a die on the face-plate. This is done by holding the pointed end of the rod *A* in the hole of the die while steadying the rod itself on the rest *B*. The die is held with beeswax and is easily centered. It will be noted that the lapping spindle with its cambric needle in place is swung up out of the way. After a die has been lapped so that it appears to be O.K. under the glass, it is tested for diameter by drawing a piece of wire through it. The operator takes a piece of wire, ties it around the forked block *A*, Fig. 5, and breaks it by pulling with the heavy pliers shown at *B*. This reduces the area of the wire at the point of break sufficiently to allow the end to be passed through the die. Then the die is placed behind the forks *A* and the wire pulled through a few inches in order to measure its diameter. The method of measuring is shown in Fig. 6. The die is held between thumb and forefinger of the left hand and the micrometer in the right hand.

A corner of the operation bench is shown in Fig. 7. The diamond crusher is shown at *A* and is a steel tube with a hardened bottom piece and a hardened end on the plunger. After crushing, the diamond dust is floated in either olive oil or gasoline and the grading done by the length of time it takes to settle in the bowl *B*. At *C* is a package of needles to be used for laps while at *D* is a pointed stick of soft wood for cleaning out the die before examining it with the glass as shown. Olive oil is used to carry the diamond dust in lapping.

British Developments in Stainless Iron

The extent to which stainless steel has revolutionized the Sheffield cutlery trade is well known, but it is not so generally appreciated, the *London Times Trade Supplement* points out, that stainless iron is of equal importance. Both materials, says the *Times*, were discovered seven or eight years ago. Stainless steel was first manufactured, and soon after it was found that stainless iron could be produced by much the same process, with the exception that a smaller quantity of carbon-free ferrochrome was required.

Stainless iron has been largely used for the production of golf clubs; it has attracted the attention of makers of stove grates and is being used for kitchen ranges, grates, and fenders. An important and useful direction in which the material has been applied is in the fitting of motor cars; it is supplied in sheets for making hoods, and there is in contemplation its greater use for bodies, and since it does not tarnish, for replacing nickel-plated parts. It is made up into a wide variety of kitchen utensils and is used for shop signs and door plates. One British firm is producing the material in wire form, to be made up into door mats, and it is also being used for spring mattresses.

Another important development in contemplation is the use of stainless iron for the furnishing of railway carriages, engines, and rolling stock generally. The proposal is that it should replace brass for door handles, brackets, and many other fittings.

PRODUCTION

Figs. 1 and 2. Two views of a Cincinnati-Acme flat turret lathe roughing out forged gear blanks of 1¼ per cent chrome-nickel steel. The forgings in the rough weigh 275 lb. and after rough machining, 93 lb. The time is 1 hr. and 15 min., and the weight of the metal removed is a little over 2.4 lb. a minute.

Fig. 3. An order for thousands of duplicate pieces makes a lathe hand feel weary, but turn it over to the operator of this Brown & Sharpe automatic screw machine and he smiles while the machine delivers 90 pieces an hour.

Fig. 4. Blanks for cluster gears are completed from bars of open-hearth steel at the rate of 30 a day in this Gridley automatic. A crackerjack workman might make four or five of these pieces a day in an engine lathe.

Fig. 5. This Gisholt turret lathe is machining 8-in. cast-iron rollers. The production is 25 a day or five times as many as could be turned out by an engine lathe.

IN PICTURES

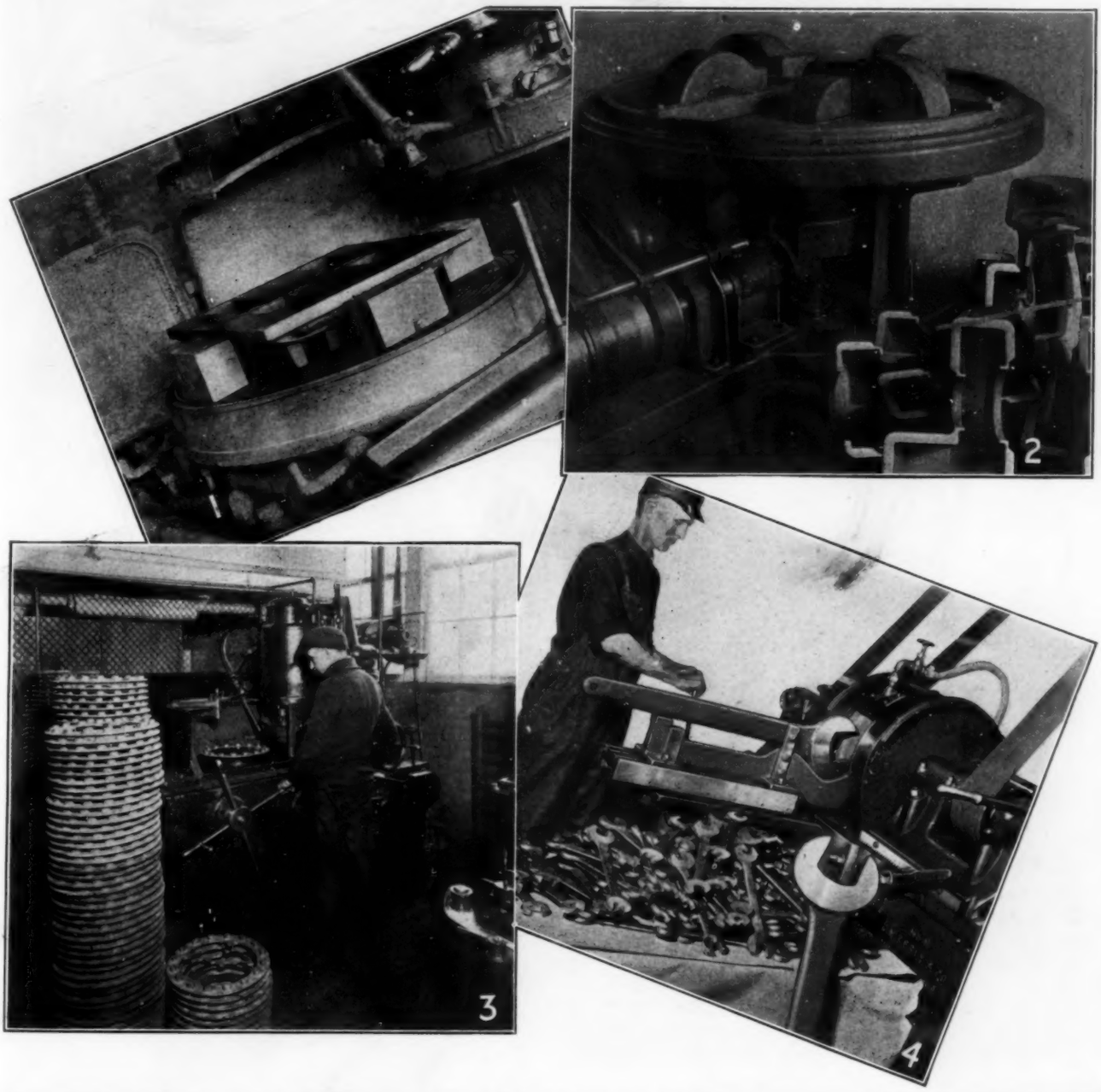


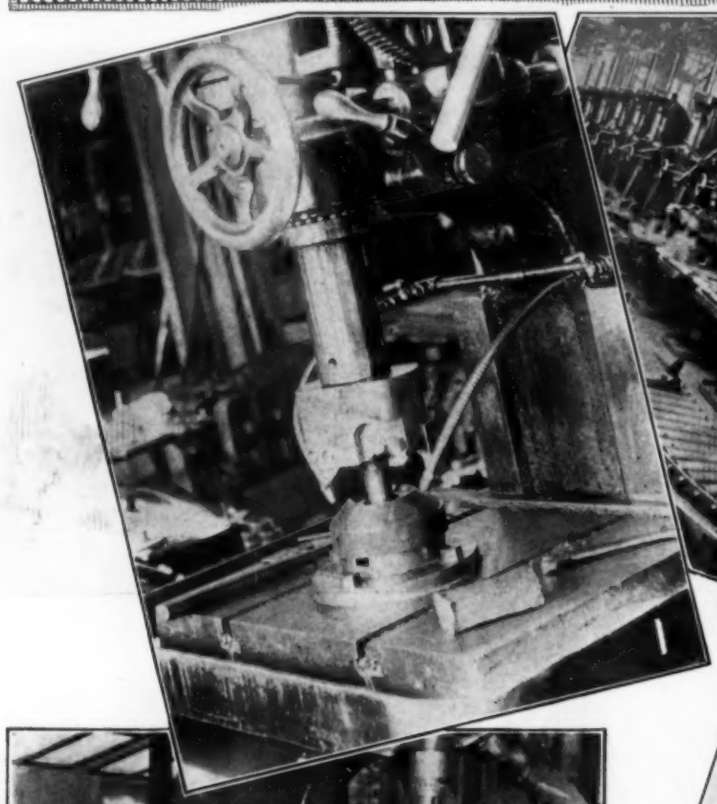
Fig. 1. Four cast-iron slide valves are being ground on this Blanchard vertical surface-grinding machine within limits of ± 0.002 in. A 30-in. magnetic chuck holds the work while ⅛ in. of stock is removed from each side. Production, 8 pieces an hour.

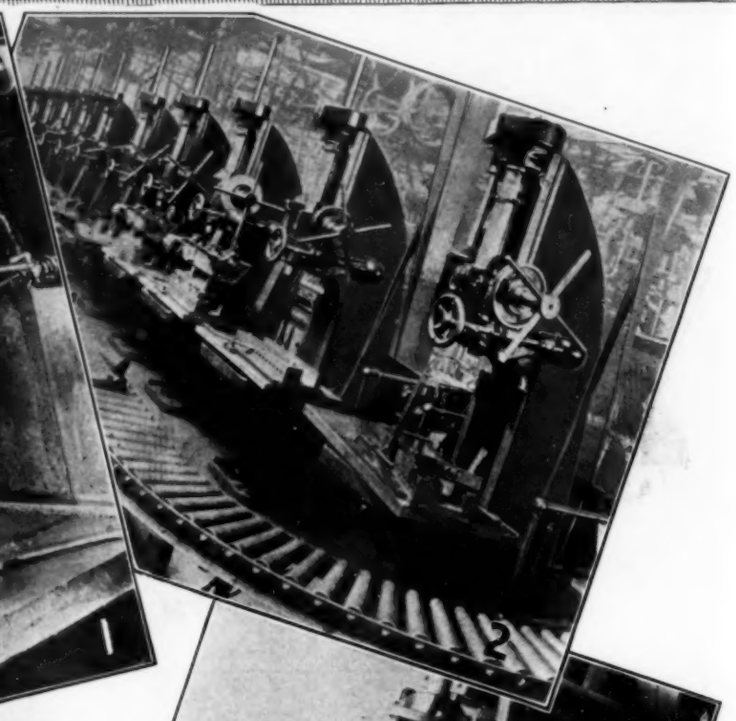
Fig. 2. Gear cases are being ground from the rough in 4 min. each on this Besly vertical-disk grinding machine. The surfaces must be flat enough to form an oil-tight joint. This operation was formerly done on a planer and required 40 minutes.

Fig. 3. Grinding cast-iron magnet coil supports on a Blanchard vertical surface-grinding machine, within limits of ± 0.0015 in. A magnetic chuck holds the work and the production is 45 pieces an hour.

Fig. 4. Grinding both sides of the head of a large wrench on a Besly wet ring-wheel grinding machine. The weight of the wrench is 9 lb. and the production is 200 an hour. The double end wrenches shown in the foreground are ground at the rate of 600 an hour.

PRODUCTION





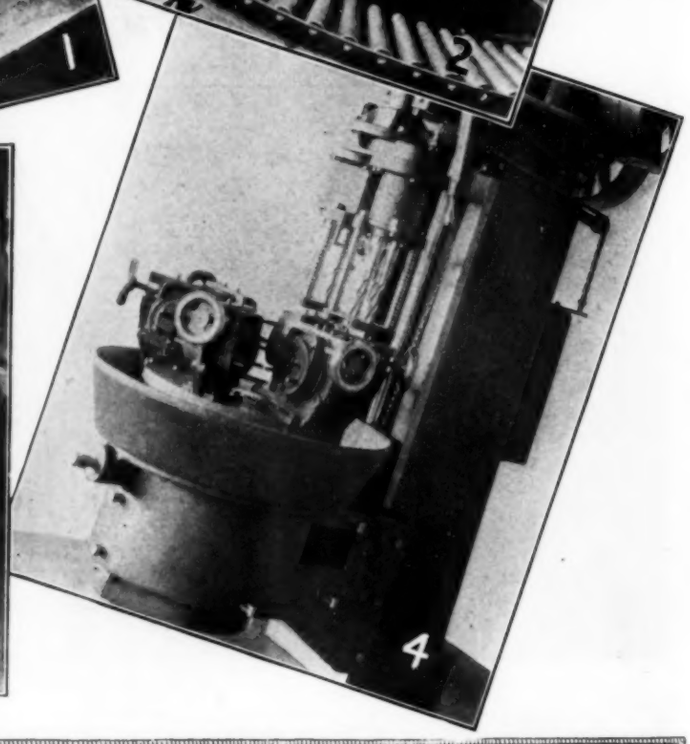


Fig. 1. The drilling machine is often used for other operations than originally intended. Here a Baker vertical drilling and boring machine is shown at work facing and forming steel bevel-gear blanks at one operation. Accurate depth of feed is secured by a stop collar on the spindle and friction feed-gears that slip when the collar comes in contact with the head of the machine. High production is possible by an unskilled operator.

Fig. 2. Nearly a dozen Baker drilling machines are shown lined up for various operations on automobile motor parts. This line of machines readily fits in with the conveyor system shown and the combination requires but little floor space considering the production possible.

Fig. 3. This Baker vertical drilling and boring machine has been adapted to boring and facing rear axle housings. The table and its elevating mechanism have been removed and an indexing fixture clamped to the column. After one end of the housing has been finished, the fixture will be indexed 180 deg. and the operation repeated on the other end. This installation requires but little floor space.

Fig. 4. Drilling electric motor frames in a Baker automatic drilling machine at the rate of 350 an hour. One fixture is unloaded and reloaded while work in the other fixture is being drilled. The machine is entirely automatic and is in continuous operation except for the time required for the table to index from one station to the other. Such machines increase production from 500 to 600 per cent over single spindle machines.

IN PICTURES

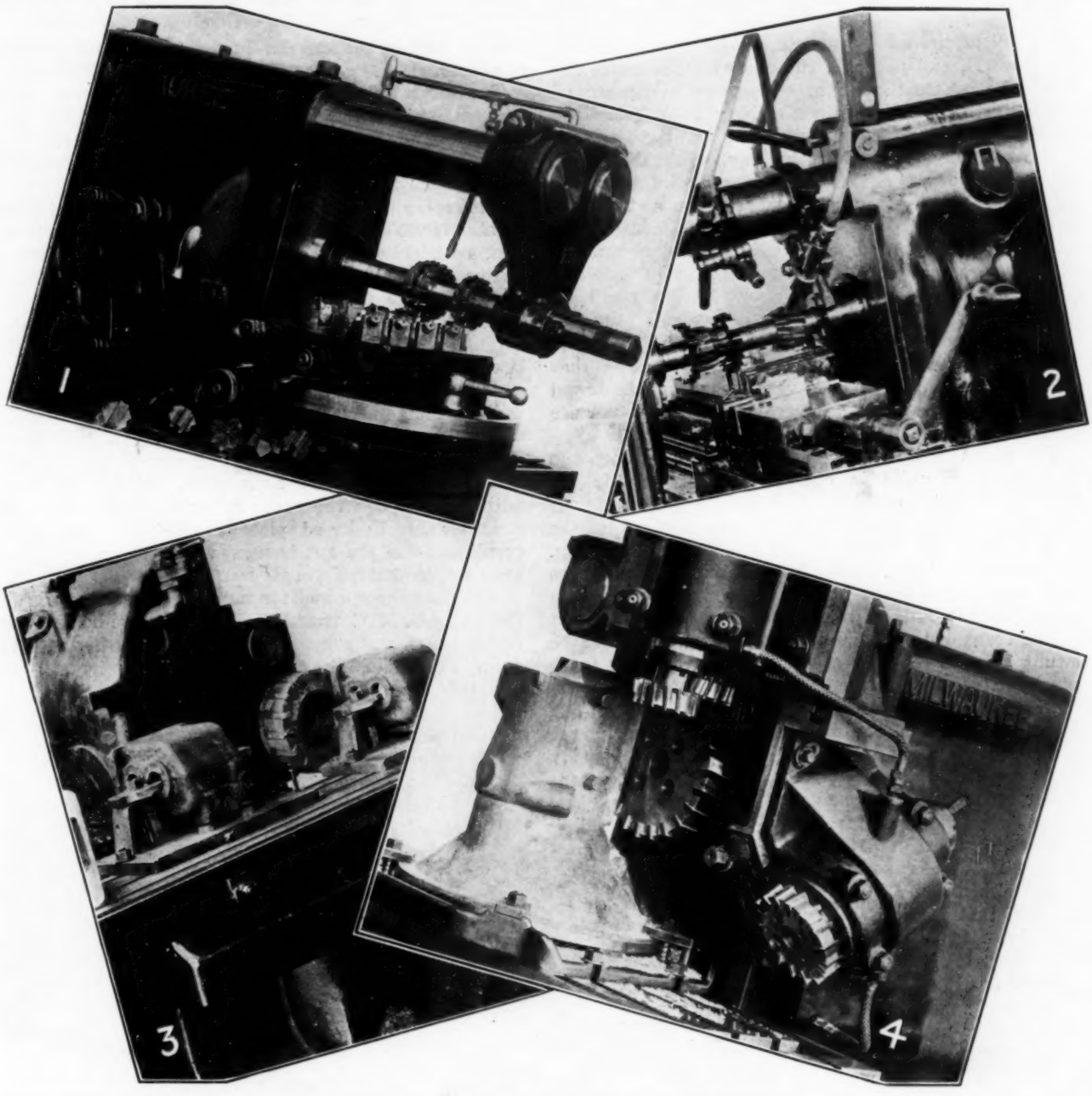


Fig. 1. Keys for rock-drill bits being milled in a Milwaukee manufacturing milling machine in one minute each. The keys are both tapering and undercut. The fixture is inclined to the angle of the undercut and arranged to be indexed 180 deg. Without this set-up three distinct operations would be necessary, increasing the time to 3 or 4 minutes each.

Fig. 2. Here is a Brown & Sharpe automatic milling machine roughing out work in one fixture and finishing it in the other. Changing is done while one operation is under way. Table motions from fast traverse to cutting feed and the reverse are automatic, as is reversing of the spindle direction at the proper time. Production: 43 pieces an hour, an increase of more than 185 per cent over former methods.

Fig. 3. When a machine tool concern takes its own medicine it is pretty good evidence of its faith in its own product. The Kempsmith milling machine here shown is face-milling parts for machines of its make at the rate of 15 pieces an hour; a saving of 45 per cent over former methods. The machine has quick traverse between fixtures.

Fig. 4. This Milwaukee milling machine is taking cuts on four surfaces of a transmission case at once. The floor to floor time is 3 min. each. Taking these cuts singly would involve several operations and handlings and require 15 to 20 minutes.

Automotive Service Methods and Equipment

II. Some of the Tools Used by the New York Telephone Co. for Keeping Its Transportation Units in Repair—Service to Public Dependent Upon Automotive Equipment

By HOWARD CAMPBELL
Western Editor, *American Machinist*

ONE of the most complete service stations in the world, and probably the one which operates for the greatest good to the greatest number of people, is that conducted by the New York Telephone Co. at Long Island City. Forty years ago the directors of the company spent an entire day deliberating over the purchase of a horse and buggy for service purposes; today the company operates more than a thousand motor cars and trucks, including 670 Fords. The estimated value of the service plant and equipment alone is around $312,000. The amount of gasoline burned up in a year's time is about 1,100,000 gallons, worth $330,000. The tire bill for one year is $160,000, and the cost of repairing the cars is in the neighborhood of $600,000. From which it can be seen that service to the public depends very largely on the brand of service received at the company's own service station.

The result is that every effort is made to keep the transportation units in operation. Not only is the best equipment available purchased, but many tools and labor-saving appliances have been devised by the various foremen. The overhead trolley shown in Fig. 1 has paid for itself many times in the saving of time and labor. The track is jointed to make a complete circuit, and is hung so that the motor can be lifted out of the front end, and the rear end of the truck can be swung clear of the floor at the same time, or the truck can be lifted off the floor bodily, if necessary.

The operator shown in Fig. 2 is using a wheel-lift, by means of which one man can remove a huge truck wheel from a truck, or replace it, as the case may be.

As can be seen, the lift rides on three large casters. The crank *A*, which is made of ¾-in. stock, turns in a bushing, or block, which is held at *B*. The crank is threaded with a 10-pitch thread at *C*, and runs through a swivel block at *D*, which is so held that it can swing up and down to adjust itself to the changing angle of the threaded part of the crank.

A very handy tool for use in a service station or repair shop where a great many automobile chains have to be repaired is shown in Fig. 3. This is known as the Spooks chain machine. It consists of an anvil, a horizontal ram which is operated by foot power, and two heavy springs which keep the ram in position for operation. The drawing, Fig. 4, shows how the ram is shaped. The section *A* is wedge-shaped, as shown, so that when pressure is applied by means of the foot-lever, the wedge will open the link so that a section can be taken out and another one inserted.

To close a link, the loop in the metal is turned so it will be forced together between the anvil and the section *B*. The part *C* prevents the loop from slipping out, and as the ram is ½ in. wide, the surface presented is adequate.

The tools shown in Fig. 5 were all designed and made in the New York Telephone Co.'s plant. At *A* will be seen a wheel bearing cap puller, used mostly on Pierce-Arrow and White trucks. The two outside legs, which are adjustable for distance from center, rest on the outer edge of the hub, while the three inner legs enter through the bearing. The shoulders, or hooks, pull the bearing out when the nut is turned.

At *B* is shown an adjustable puller which can be used in a number and variety of places. The tool shown at *C* is a Pierce-Arrow camshaft puller. The section at *c*, which is a part of the stud, is threaded in the end to screw on to the end of the camshaft, which is also made with a thread on the end. After being attached, the ends of the U-shaped piece are braced against the crankcase, and the nut is turned with a wrench, which pulls the camshaft from its bearings.

At *D* is shown a tool for pulling the clutch from the shaft of a G. M. C. truck. The two legs are hooked back of the clutch and pressure applied by screwing the stud against the end of the clutch shaft. The universal joint flange is removed from the other end of the shaft by means of the tool shown at *E*, which operates in practically the same way.

The large tool at *F* is a Pierce-Arrow spring chair puller. The big collar, which is at the right-hand end in the picture, is locked back of the arms which support the brake shoe. The round disk which is shown wired

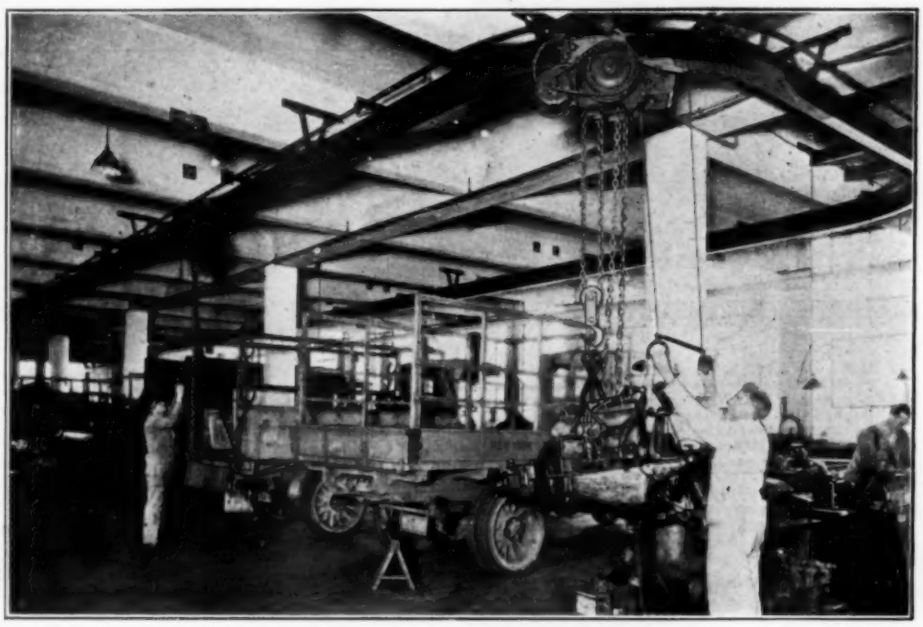


FIG. 1. OVERHEAD TROLLEY FOR LIFTING MOTORS

to the frame is then placed in the end of the shaft and pressure is applied by means of the screw.

The tool shown at *G* is used for removing drive shaft sleeves from Fords. This sleeve, as an automobile mechanic knows, is about 3 in. long, and is made of steel tubing. Careful examination of the cut will reveal a shoulder at *g* which fits over the end of the sleeve when the tool is in position and the hinged part is locked in place. The operation of the tool is obvious.

Another collection of interesting service tools is shown in Fig. 6. At *A* is a Ford clutch drum puller. The Ford clutch drum has four holes drilled in it at the factory, perhaps for the purpose of removing it when necessary. The pins at the ends of the legs fit into two of these holes and pressure is applied on the end of the shaft in the usual manner. A tool for pulling roller bearing cones from their spindles is shown at *B*. The square block at *C* is for the purpose of holding Ford camshaft bearings for hand reaming. These bearings

FIG. 2. DEVICE FOR LIFTING OFF WHEELS

come from the factory with a hole drilled in the side, and this hole is utilized in this instance to prevent the bearing from turning while it is being reamed. The bearing is inserted into the block, the little screw seen in the illustration is screwed into the hole, and the block is placed in a vise. This method of holding the bearing prevents all those troubles which would result from holding the piece between the vise jaws and the application of the necessary pressure to hold the piece and keep it from turning.

The crank shown at *R* is threaded on the opposite end from the handle, the thread being of the same pitch as that on the end of a Ford crankshaft. Thus the crankshaft can be turned while working on the bearings, etc., with a great deal less effort than is usually expended on this simple operation. At *E* is a puller for removing universals from the shafts of White trucks. The holes in the legs fit over the lugs on the universals

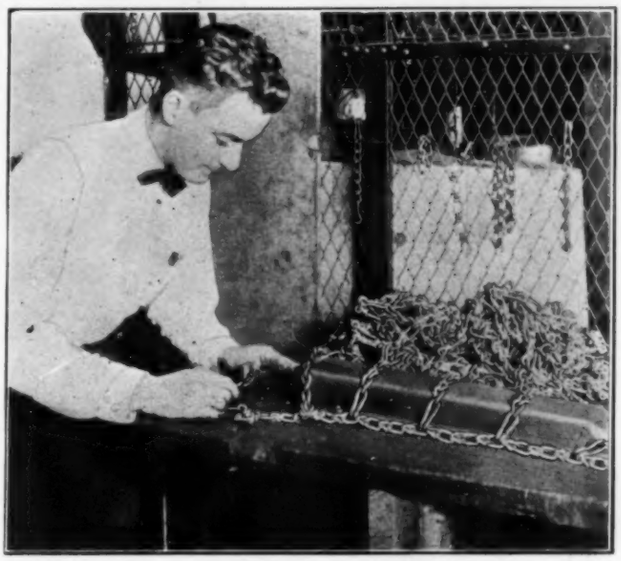


FIG. 3. SPOOKS CHAIN MACHINES

and pressure is applied at the end of the shaft as usual. A tool for removing ball bearing races from magneto shafts is shown at *F*. The tool consists of a heavy bottom plate and a top plate, held together by two bolts as shown. The top plate is drilled and threaded for the stud which goes through it, and the bottom plate has a hole bored in it which is large enough to slip over the race. This hole is countersunk to receive a split collar. One of these is shown just below the armature. With one of these collars seated in place behind the ball race, pressure is applied against the end of the shaft and the race removed. This tool can be used on various sizes of armatures, by using the corresponding collars, while the tool shown at *G* is applicable to one size only. The tool shown at *G* consists of a bolt, a bushing and a knurled collar. The bushing is made in two halves, both of which are hinged onto the plate which holds the screw. A shoulder is cut in the bottom of the bushing similar to that shown at *g* in Fig. 5. The bushing is placed in position with this shoulder engaging the ball-race, then the knurled collar is slid down to the lower end of the bushing to hold the two halves together. Turning the screw then pulls the ball-race from the shaft.

A Packing Compressor

At *H* is shown a transmission rear bearing case packing compressor which is used on a 5-ton Pierce-Arrow truck. The line drawing, Fig. 7, will illustrate the working of this tool. The tool is held in the vise-jaws as shown; the steel washers, felt packing and retainer ring are placed in position in the bearing case. Then the collar *A* is placed in position, the nut *B* is screwed on to the stud and tightened down, compressing the packing

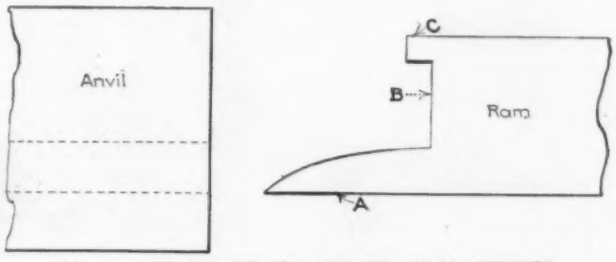


FIG. 4. DETAIL OF SPOOKS CHAIN MACHINES

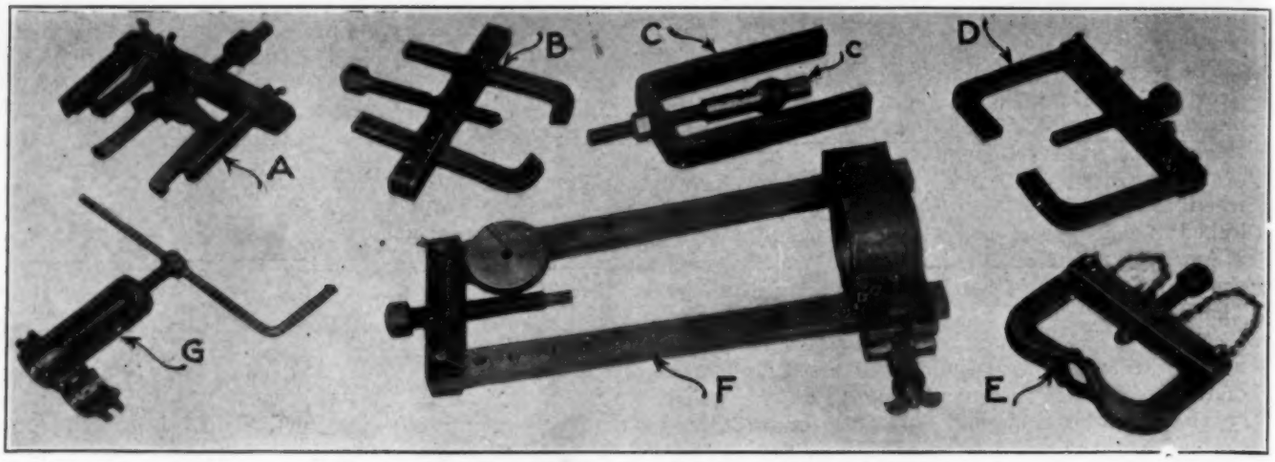


FIG. 5. TOOLS DESIGNED AND MADE IN COMPANY SHOPS

and allowing the retainer ring to slip into its groove.

Returning to Fig. 6, a Ford pinion gear puller, for pulling the pinion gear from the drive-shaft is shown at *I*. The operation of this tool is obvious.

A tool for releasing the clutch disk spring on the GMC truck is shown at *J*. When the clutch is removed from the car, the clutch spring remains compressed until released. To effect this, the tool shown is slipped through the clutch in place of the clutch shaft. Then the nut and collar are put on and screwed down against the cup which is over the end of the spring, compressing the spring still further and releasing the tension on the pin which holds the spring in compression. The removal of the pin then becomes a simple matter.

A hand punch press is shown at *K*, and beside it the piece of work on which it is used. That portion of it extending below what might be termed the table of the machine is gripped in a vise, so that the handle may be worked up and down vertically.

The frame *a* of this machine is cut from a steel block milled out to allow for the handle and for the ram which holds the punch. The ram has a slot milled through the upper part, and is cross-drilled to accommodate a roller *b* which is held by the pin *c*. This roller comes in contact with a cam at the lower end of the handle. Thus when the handle is pulled down, the handle also forces the ram down performing the operation required, which is the punching of slots in brass strips to be used as fins for repairing in radiators.

At *L* is a simple tool for holding a piston ring so that the side of the ring may be polished to remove high-spots, burrs and so forth. The tool is made from the flange end of a Ford crankshaft. It is counter-bored just deep enough to leave about $\frac{1}{32}$ in. of the ring projecting. The tool is held in the hand and the ring rubbed over a piece of emery cloth lying on a face-plate or other smooth block.

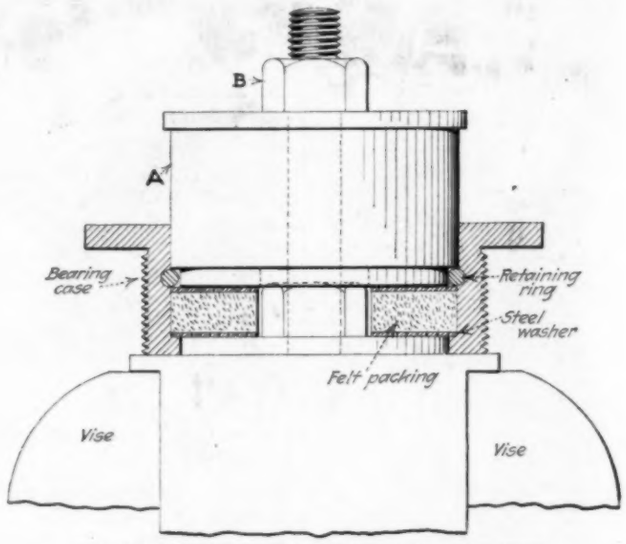


FIG. 7. DETAILS OF PACKING COMPRESSOR

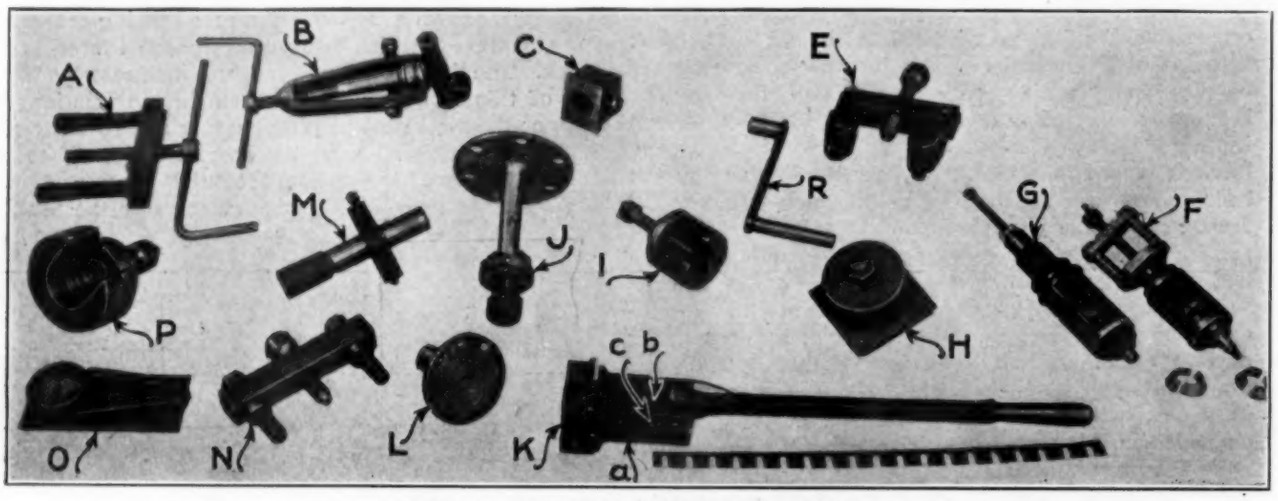


FIG. 6. SOME MORE HOME-MADE TOOLS

The tool shown at *N* is for pulling the flywheel out of White truck motors. These flywheels have two holes in them, into which the two studs shown in this tool can be screwed, pressure being applied by screwing down the bolt in the center.

A unique and interesting tool is shown at *O*. This is a magnet tester made from an old speedometer. The shaft to which the hand is attached runs through a small gear which meshes with a sector in the case. This sector is attached by means of a small coil spring to a piece of sheet metal which is fastened just inside the case on the side nearest the magnet. When the magnet is placed on the block as shown in the photograph, if it is magnetized properly, the piece of sheet metal will be attracted toward that side of the case, pulling the sector with it and revolving the hand. The determination of the amount of magnetism indicated by the figures on the dial is a matter of experience.

A transmission drive gear puller for use on Fords is shown at *P*. The groove in the tool fits over the first one of the three gears on the transmission shaft

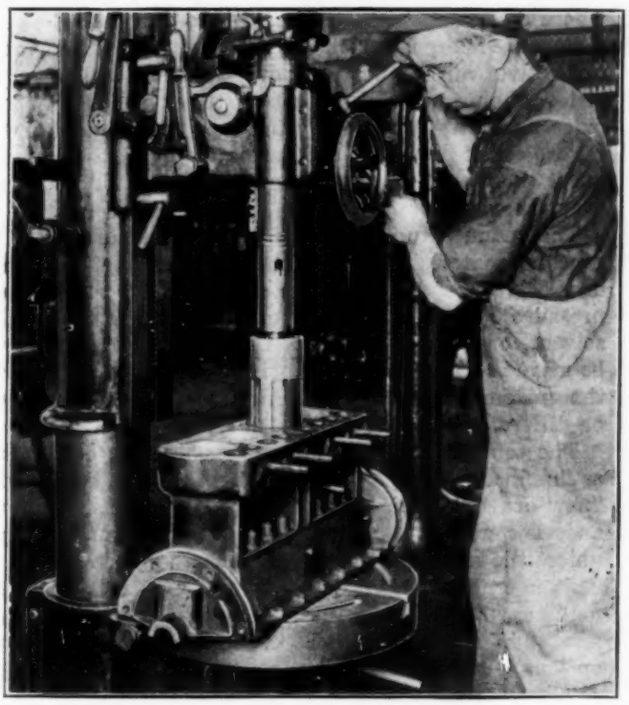


FIG. 8. REBORING CYLINDER BLOCK

and operates in the usual manner. After the first gear is removed, the transmission can be easily disassembled.

The operation shown in Fig. 8 is that of re-boring a cylinder block with an expansion reamer. This reamer, which is made by the Standard Tool Co., of Cleveland, Ohio, can be adjusted to various sizes within certain limitations.

The operation shown in Fig. 9 is that of re-boring the main bearings in a Ford crankcase. The frame *A* is fastened to the crankcase by the bolts and wing nuts *B*. The cutter bar *C* has a tool for each one of the crankcase bearings. When the tool is in position, the larger gears, *D* and *E*, are slipped into mesh with the pinions *F* and *G*. The pinion *F* turns the shaft with it as it revolves, but does not feed the shaft through the work. Pinion *G*, which is of bronze, is cast on a sleeve approximately 3½ in. long. A square thread is

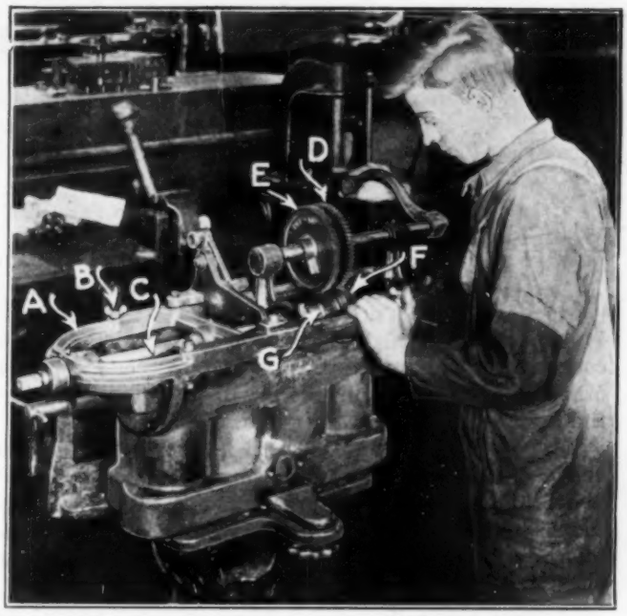


FIG. 9. REBORING FORD CRANKCASE BEARINGS

cut on the shaft where it passes through this sleeve, a corresponding thread being cut in the inside of the sleeve, so that if the sleeve were held stationary while the shaft was revolved, the shaft would be fed rapidly through the sleeve. In order to reduce the feed to the necessary fineness, the gear *E* and pinion *G* are applied, so that when the gears are in motion, the sleeve is turned in the same direction as the shaft but just enough slower so that the shaft is fed through a little with each revolution. This fine feed gives the necessary finish to the bearing.

The operator in Fig. 10 is using a straightening templet to test the straightness of a Ford crankcase (lower half) which has just been welded. The collar at *A* locks the front bearing supports and the two bolts at *B* are screwed into the corresponding holes in the crankcase. Then the two studs at *C* must slip easily into their respective holes; if they do not, the case has to be straightened until they do. When these studs will drop into place, the crankcase will fit into place on the machine very easily.

FIG. 10. TESTING FORD CRANKCASE FOR STRAIGHTNESS

Business Tanks and Valves

An Imaginary System of Tanks and Valves to Illustrate the Operation of Business—Economics and the Golden Rule

By Ernest F. DuBrul
General Manager, National Machine Tool Builders' Association

We need a good way to visualize the flow of business through the economic system, in order to understand how it is that a market is subject to periods of glut and activity. Suppose we conceive the system as a series of tanks, one above the other, connected by pipes that have valves to control the flow down through the pipes.

The lowest pipe has the consumer valve. This we can say is regulated by the consumer alone. Nobody above him has any hand on that valve. The consumer himself opens it up or shuts it off, according to his purchasing power. If butter is too high for the purchasing power of a laborer he buys oleo; the family uses less butter; they don't make so many cakes; and so on, so that each consumer takes a little turn on the butter valve.

The tank that is being drained through the consumption valve is the dealer's tank. His valve on the pipe leading into this tank is the "shipment" valve. As he finds that the consumers shut off their valve below him he should know that his own tank will fill up, and if he does not shut off the shipment valve his tank will get too full for its financial underpinning. He will run out of money, and then he will have to try to lower the level in his tank by making lower prices to induce the consumer to open up his consumption valve. At such times these prices will have to be made so low that his excess goods must be sold below their cost to him, and he will be out of pocket.

Many business men do not understand that they must keep a proper balance between their financial resources in ready cash and their stock on hand. If this factor gets out of balance, financial resources are locked up in stock, and to pay bills the dealer has to sell the stock. To sell the stock of goods on a dull market a price must be made that will induce the consumers to open up their "consumption" valve and let more stock flow on through, than the consumer really wants. The dealer's stock tank represents both the wholesaler and retailer, though each one has a tank operating in the same way.

Next above the dealer's level is the manufacturer's level. It has three tanks, the "factory stocks" tank being the one that drains down through "shipments." As the dealer's tank fills up the dealer must shut off shipments, so the manufacturer's tank then begins to fill up more than it should. If his tank gets too full for safety, he tries to force more product down through the "shipment" valve. He offers a lower price, just the same as the dealer did. If the dealer's tank is not too full the manufacturer can perhaps move some of his stock on down at a lower price, but only as long as he can find some dealer whose tank is not full, or in other words, one whose financial strength is not used up. By buying at a lower price the dealer is able to make a lower price to move the stock out down below, and dealers with full tanks have to take a loss on their stock, or else stop business.

The pipe leading into the manufacturer's stock has the "production" valve. When the manufacturer's tank fills up he has to shut off production until the tanks can be drained down, and a balanced flow can be started again.

Unfortunately, very few industries can accurately gage this rate of flow through the "consumption" valve, and very few industries have studied that flow as a whole. The individual dealer or manufacturer knows only what is in his own tank, and what is flowing into it and flowing out of it. He does not know what is in other tanks below him, above him, around him. He does not know the rate of flow out of them, either individually or collectively. He generally can only go blindly on until he finds that he is getting to the point where he is unsafe. Then he shuts off his valve.

Because many men do not know when to shut off their respective valves they get over-stocked, and then to relieve the pressure on their tank they have to put their price pumps to work to try to move the stuff on down, regardless of costs. If the jam is too great they simply burst their part of the system and spill their goods all over the place.

The manufacturer has his inventories, of goods in process, materials, etc. If he has raw material that is saleable on the open market, he can relieve some excess pressure by sacrificing this material. As long as he is solvent, once his goods start down in process they will be moved on down, at some price or other clear through the system to the consumer, but the rate of flow will be different for different kinds of goods.

The topmost tank of the whole system is designated as "unfilled orders." Through the funnel at the top the "new orders" come in. In some lines of business once an order gets into that tank it goes clear on through, unless the man who placed the order becomes insolvent. This is true of the pig-iron business, which is one business that holds buyers to their purchase contracts. In most businesses, however, "orders" are mere "buyers' options"—a sort of condensible "gas."

This unfilled orders tank has a whistle on the top—"cancellations." When the pressure gets too strong on the dealer's tank the excess pressure is blown off through "cancellations" and it makes a loud noise.

The string leading down from the "cancellation" whistle is represented as having a handle for the dealer to grab. In some cases it goes on down to the consumer. But the manufacturer does not have his hand on that cord at all. If he were wise he would have a "shut-off" valve" on the new orders, and he would refuse to take new orders when he finds the pressure in the unfilled orders tank mounting up too high for safety. If all systems were like the pig-iron system, and had eliminated the cancellation whistle it would mean that all the various tanks would get more watching, and the valves more regulating, especially when the consumer begins to shut off his valve. It would make everyone more careful in buying, or he would blow his own tank open.

This would mean healthier and saner business all around. How can one determine the rate of low and

the tank levels? Well, trade association statistics, if reasonably complete, can and do do that very thing. Secretary Hoover has the right idea in asking such associations to study their actual conditions. He has well said that "given all the facts, any business problem can be solved." It does no good to have an unsafe quantity of goods in the tank system when the flow through consumption is restricted. Society wants and needs a regular flow and a safe level. It does not want and does not need a glut anywhere or any time. The better the flow is balanced all through each system the more regular will employment be, the more sane will management be, and the safer will investment be. A lot of healthy results will follow in every industry that will gather all the figures monthly, as to the contents of all the tanks and the rate of flow through all the valves, in its own system.

If too little is flowing to supply actual needs, it will be easier to know when and why new plants should be built, and old ones enlarged. If too much is seen to be glutting the tanks at one time, leading to more and more irregular, and less and less profitable operation, capital will be diverted to industries that need it, instead of being invested in industries already overdone.

As years go by and better understanding is had of the actual workings of economic forces, more and more industries are getting to realize the necessity of studying the relation of supply to demand for their own products. Consequently they organize statistical bureaus to gather this information. They gather information as to past years so that the experience of the past will be as much a gage as possible for the future. They gather information for the present demand so as to know the flow and the relative levels in the various tanks. It is true that some of these organizations still seem to have the fallacious idea that somehow they can, by concerted action, regulate the flow.

Society is benefited by close regulation of supply to demand. It is benefited by not having plants built that are actually unnecessary. It is benefited by using the capital that would be thus wasted in providing facilities for producing other goods. But no organization can deliberately regulate that flow any more than any socialist bureaucrat sitting in a government office can do it.

Society must have a free market, one in which every buyer has access to every seller, and vice versa. The freer the market is, the better will competition take care of regulation. Perfectly free competition involves intelligent competition. If every concern were fully informed as to costs of production in its own line, and if every buyer were equally well informed, then prices would be proper for both sellers and buyers. The buyer would expect to pay enough for his goods to cover their costs and the seller's fair profit; and the seller would not expect to get more profit than the buyer ought to pay him to produce the goods under given circumstances. As it is now, the difficulty lies in not enough information being available to either consumers or sellers to enable them to gage the market and to adjust their respective bid and asked prices to actual conditions.

Some concerns set their prices in flush times on a basis of low costs at maximum capacity of their plants, and a small unit profit at that rate of production. The fact is that due to the waves, long time costs actually rest on a basis of considerably less production year in and year out. When that kind of a seller goes out in the market he commits either business murder or business suicide by quoting prices that are lower than the economic level demands. If a price is not realized at such times that will provide a reserve to meet the next depression the concern has to dip into its original capital to tide it over the gap in demand.

There is nothing in the law that does or should prevent intelligent competition. There is nothing to prevent a man from having full information as to the market that he is attempting to reach. Such information is manifestly for the benefit of society as a whole, and both buyers and sellers should have free access to it. The law does say, and properly, that there should be no artificial restraint of the market. Even if there were no law to condemn artificial restrictions and interferences with competition, such practices are unwise and uneconomic, and such restrictions always carry within themselves the seeds of their own dissolution. Those who try such restraints try to work against economic law, as well as against statute law. This cannot be successful economics because it is unsound economics, and should be abandoned for that reason if for no other. Cut-throat competition is just as uneconomic, and brings its own penalty by compelling the competitor to retaliate in order to preserve his own existence, and the cut-throat loses more than he can possibly gain. Here again, what is perfectly good economics is strictly in accord with the Golden Rule.

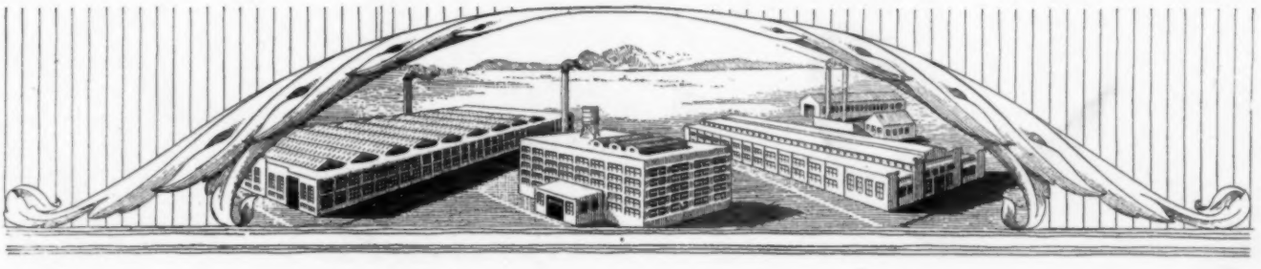
Australian Attitude on Motor Cycles

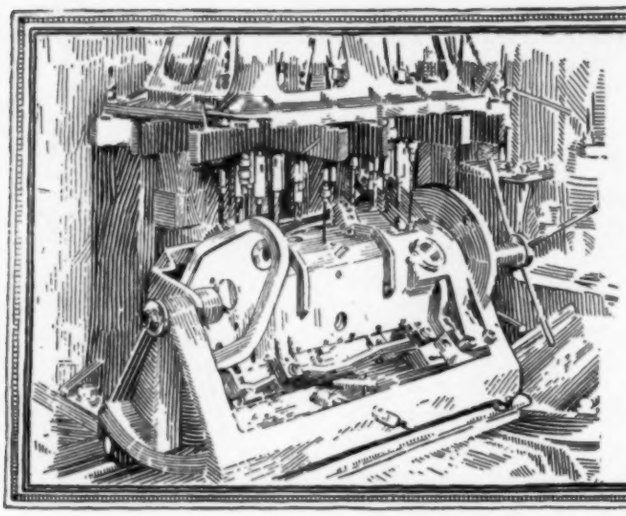
An interesting side light on the attitude of Australian motor-cycle traders is given in a letter from a Sydney firm to a London publisher, an excerpt of which is printed below:

Our firm are importers of motor cycles only, not handling cars at all; and the position with us is that English motor cycles have become prohibitive in price, and the trade started with America during the war will have to be maintained until such times as the present English prices are cut somewhere in half.

We have landed a few sample English machines—such well-known makes as Matchless, Sunbeam, and Triumph—and find these lines unsalable at landed cost prices.

You will realize under the circumstances that we have no option but to continue our trade with American motor cycles exclusively until such times as landed costs of English goods are enormously decreased.





Tool Engineering

By
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Albert A. Dowd Engineering Co., New York City

Turret and Engine Lathe Tooling for Second-Operation Work—Collets, Step Chucks, Chuck Jaws and Adapters—Construction of Fixtures—Soft-Jaw Chucks

WE HAVE discussed in a previous article a number of methods of holding rough work on chucks and fixtures for turret lathe operations. It frequently happens that several operations are necessary on a turret lathe, or it may be that work has been previously machined on some other type of machine tool prior to the turret lathe operation. Under these circumstances, the location of the work for the turret lathe operation must be determined from some of the previously finished surfaces or holes. This article will take up a number of methods of holding work for a second operation locating from some previously finished surface.

There are several conditions which may affect work-holding devices of this kind. The piece may have been machined in circular form, either on the outside or the inside; it may have been drilled and reamed on a drill press; or it may have been milled, or otherwise machined on some other type of machine tool. For the turret lathe operation it is necessary to locate from some of these finished portions in order that finished dimensions may be held accurately to size.

Collets, Step Chucks and Chuck Jaws

We have previously devoted some space to a description of collets, step chucks and chuck jaws, and much of the matter mentioned in connection with these devices can be applied to second-operation work. It is important, however, to observe that collets which are used for work which has been previously machined, are commonly not checked or grooved, but are left smooth and ground out accurately to the size of the work which they are to hold. Care must be taken not to mar the work by using jaws or other holding devices which will tend to rough up the finished surfaces.

The matter of provision for chips and dirt is particularly important in connection with fixtures used for second-operation work. The greatest care should be taken to make all locating surfaces in such a way that they can be easily cleaned, so that the required accuracy will be obtained. Distortion caused by improper clamping, counterbalancing of the fixture in order to make it run without vibration, and projecting clamps or lugs should all be given due consideration; but, as these points have all been mentioned previously, it is unnecessary to go into detail regarding them, except in specific cases which will be hereinafter mentioned.

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Application of Adapters

In making up a fixture for use on a turret or engine lathe, it is advisable to avoid, as far as possible, fitting the fixture to the spindle. Spindles are threaded and turned, and any fixture which is to be applied to them must be very carefully bored out and threaded in order to obtain accurate work. If a number of fixtures are to be made up, this extra fitting to the spindle is costly and should be avoided by using some form of adapter of standard pattern, to which the fixture itself can be attached. Fig. 240 shows a simple diagram of a fixture *A*, which is fitted directly to the spindle at *B*. In making up a fixture of this kind, its cost is increased considerably on account of the fitting operation. Furthermore, if any part of it should be broken or injured, it would be necessary to replace the whole fixture and again fit it to the spindle. By the use of an adapter, such as that shown at *C*, the fixture *D* can be located on it at *E* by simply boring out the fixture to fit the flange. It can then be bolted in place with the assurance that it will run true with the spindle.

Another advantage of using an adapter for fixture work is that adjustments can be made in the fastening of the fixture to the adapter, so that it can be trued up if it becomes untrue after a long period of service. When a fixture is made as a unit to screw onto the spindle, it is difficult to make any adjustments after it has once been constructed. If it becomes inaccurate from use it will very likely remain that way, on account of the difficulty of making any changes which will bring it back into shape again. Several forms of adapters were shown in the first article on turret lathe work.

Any factory which uses fixtures of this nature to any extent should consider very carefully the standardization of adapters for the various machines to which fixtures are to be applied. On small-sized fixtures it may be found more convenient to use a center plug in the adapter, or a center hole into which a plug in the fixture can be set, rather than to use a flange such as the one shown. In standardizing a proposition like this, the

designer should make drawings of the spindles of the various machines used, and try to make the adapters so that they will be generally uniform and without too many sizes of flanges to which fixtures are to be fitted. If flanges are made in only two or three standard sizes, it will be found possible to transfer a fixture from one machine to another when this seems desirable. In the case of a machine breakdown, or in transfering a machine from one department to another, an arrangement of this kind will often be found a great advantage.

Construction of Fixtures

In considering the general features of construction of fixtures for turret and engine lathes, attention should be called to a few points of importance. Most fixtures are made of cast iron, although aluminum and steel are used occasionally. The necessity for keeping fixtures of this kind as light as possible, and at the same time attaining the necessary stability and rigidity, must be emphasized. Excessive overhang on the spindle is likely to cause vibration when the cutting tools are applied to the work, although the fixture may run true before the tools are applied. If it becomes necessary to make a very long fixture, or one which extends a considerable distance beyond the spindle end, suitable provision should be made to support it in some way or other, and thus take the strain off the spindle. This point was brought out in the last article with an illustration of a condition similar to that mentioned.

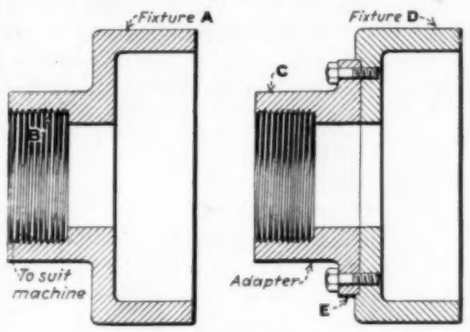

FIG. 240. ADVANTAGE OF USING ADAPTERS

In the making up of fixtures, it is usually better to build up angular surfaces on the fixture rather than to attempt to make a casting with suitable projections on it. An important point is shown in Fig. 241 at *A*, in which an angular pad *B* is made up as a part of the fixture *C*. If this angular portion should be broken, or if it were to be sprung out of true the entire fixture would have to be scrapped. Furthermore, the casting is more difficult to make when in this form, than if a construction like that shown at *D* were to be used. In the latter case, the angular portion is made up as a separate member *E* and fastened to the faceplate. In a like manner, locating pads or surfaces can often be made up separately in the form of steel rings or steel blocks, as may be required, these being fastened to the face of the fixture in order to provide for up-keep in case of injury.

Fixtures which are made to hold an irregular piece of work having considerable weight at one side of the center are frequently counterbalanced, particularly when they are to run at high speed. An example which illustrates the proportioning of a counterbalance is shown at *F*. The work *G* has a heavy portion *H* eccentric to the center hub, and on account of this a counterbalance should be provided, as shown at *K*. In making up this counterbalance, it is usually better to make it up as a separate unit and fasten it to a pad on the fixture, as at *L*. Care must be taken in proportioning it so that it will have more than enough metal to offset the portion of the work which is being balanced; then after it is placed in position with the work on the fixture, it can be drilled out, chipped or faced off so that it balances the work perfectly.

It is possible to make a counter-balance in such a shape that it is adjustable, so that several pieces of the same character can be held on the same fixture, by adjusting the weight. It is well to avoid the use of very heavy masses of metal in fixtures of this kind, and it is better to make provision for stability by means of ribs. It is not good practice, however, to have these ribs project from the fixture so as to cause trouble to the operator and to endanger him. It is frequently possible to cast a narrow rim around the fixture, leaving the outside smooth in order to guard against accidents. If all clamps, bolts and screws are kept below this surface, the fixture will be much better for the operator and present a cleaner and more workmanlike appearance.

Use of Soft Chuck Jaws

Chuck jaws which have not been hardened are often used for second-operation work, being bored out to a diameter such that they will fit the work on some portion which has been previously machined. The method of holding by means of soft jaws cannot be considered as strictly accurate, due to variations which are likely to be found in the chuck itself, and caused by wear on the scroll ring and also on the teeth cut on the jaws where they mesh with the ring. There is also a certain amount of "back lash" in nearly all chucks which are not new, and this matter also may cause slight inaccuracy. Soft jaws are, however, very convenient for certain classes of work and can be used in many cases. It is a matter of judgment regarding the accuracy required when deciding whether to use this method of holding. One of the advantages of soft jaws for second-operation work is the fact that they can be trued up and bored out in position with considerable accuracy. The method used is to hold a piece of cylindrical work in some portion of the jaws which is not to be bored, and grip it tightly by means of the jaws so as to take out any back lash that might otherwise cause trouble. When the jaws are in this position they should be bored to the exact size of the work which they are to hold. After this is done the chuck should not be removed from the spindle center, and no change is to be made in its location with respect to the spindle.

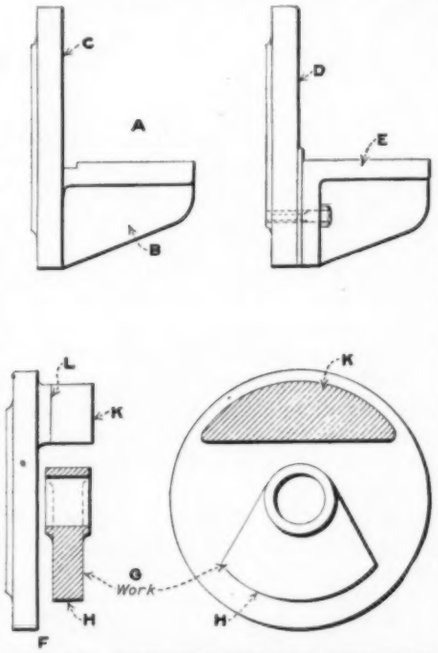

FIG. 241. CONSTRUCTION OF FIXTURES

Soft jaws are used on both two-, three- and four-jaw chucks, but less commonly on the two- and four-jaw variety. They are generally made of cast iron or machine steel, depending on the requirements, and

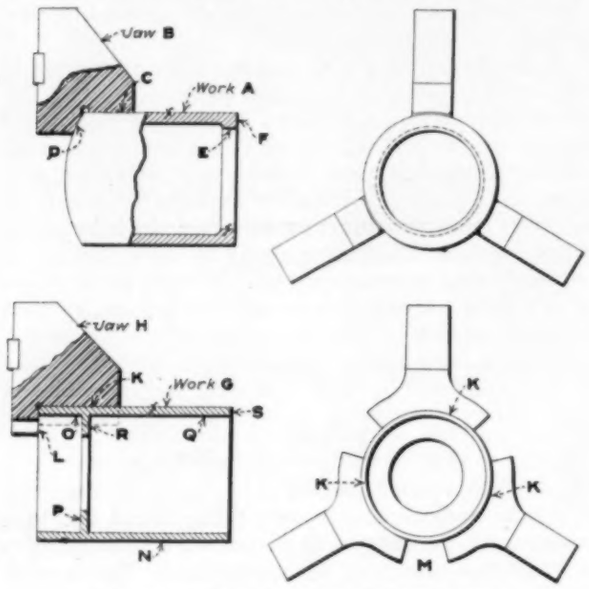

FIG. 242. USE OF SOFT CHUCK JAWS

somewhat upon the size of the chuck on which they are used. For a great deal of work, cast iron gives perfectly satisfactory results, although some users prefer machine steel. Jaws are generally made in a form such that they can be attached to the regular jaws of the chuck by means of screws.

In the example shown in Fig. 242, the work *A* has been previously machined on the outside and the curved end. Therefore, the jaws will be bored out at *C*, and formed at *D* to act as a seat for the end of the casting. The operation for which the jaws are made is the boring of the portion *E* and facing it at *F*. After this operation, the casting is to be refinished on the outside diameter, and all subsequent operations locate from *E* and *F*. For the condition shown, very satisfactory work can be obtained by this method; and due to the general construction of the casting, there is no possibility of distortion. It is possible to make up jaws of a similar kind but with soft portions inserted, so that replacements can be easily made. This, however, is not commonly done, as the method shown is cheap and generally satisfactory for the majority of cases. When a chuck is to be removed and replaced frequently, as might be the case when small lots are being manufactured, it might be more profitable to use inserted jaws. The designer must be governed by conditions in determining which type to use.

In holding thin work in soft jaws, there is always more or less danger of distortion, as has been previously mentioned. An example of this is shown in the work *G*, which is a thin cast-iron sleeve previously machined at *N*, *O* and *P*. This casting is so thin that it would be distorted if held by a method like that shown for the work *A*. By making jaws of special form with large ends, as shown in the view *M*, a large part of the circumference will be enveloped by the jaws, and thus prevent crushing or forcing the casting out of shape. The jaws *H* are bored out at *K* to the diameter of the work and a seat is provided at *L*. In using these jaws, the surfaces *Q*, *R* and *S* can be easily machined without danger of distortion. This is an example where the large ends of the jaws could be made of separate pieces and fastened to the regular jaws, if it seemed desirable.

Many times there are several methods which can be used for holding a given piece of work, no matter whether it is a first- or second-operation job. Sometimes there is a choice between the methods, both as regards economy and also the accuracy obtained. Fig. 243 shows a piece of work *A*, which has been previously finished at *B*, *C*, *D*, *E*, *F* and *G*. The requirements of the work are that the portion *H* must run concentric with *B* and be square with the flanged portion *C*. In the first method suggested the work is held in soft jaws *K* in a three-jaw chuck. The jaws are bored out so that they fit the portion *B* of the casting. In order to make sure that the flanged portion *C* is square, clamps are provided at *L* directly at the jaws themselves. Provision is made in the clamps so that they can be slid back away from the work when removing and replacing it.

As previously mentioned, there is a possibility of inaccuracies resulting from a method of holding like this. Therefore, it was decided to use a fixture in place of chuck jaws. This fixture is shown at *M*. It is bored out at *N* and threaded to fit the end of the spindle, but it could readily be made so that it could be applied to an adapter. In locating the work, a hardened ring is used

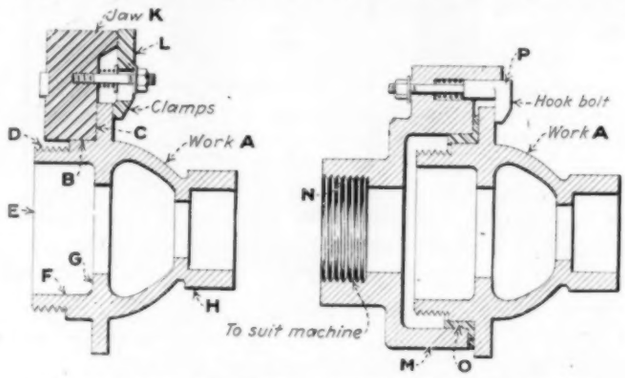

FIG. 243. TWO METHODS OF HOLDING SAME PIECE OF WORK

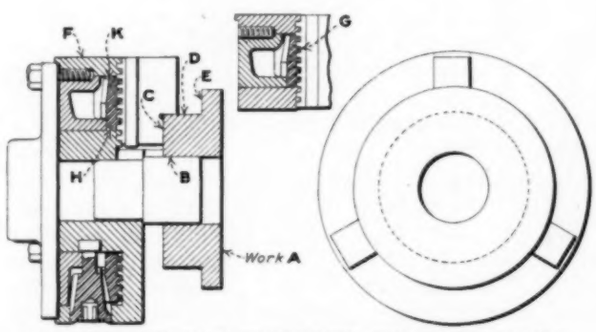

FIG. 244. CHUCK FITTED WITH FLOATING SCROLL

at *O* and the work is clamped back against the ring by means of hook bolts at *P*. These are three in number and operate from the back of the faceplate. This construction makes a clean-appearing fixture, and one which has no projections likely to catch on the clothing of the operator. The steel locating ring *O* can be ground to size in place on the machine, and it can be readily replaced in case of inaccuracy.

It is sometimes necessary to hold a piece of work for a second operation when it is difficult to grip it securely by means of clamps in a fixture. A case in point is shown in Fig. 244 which illustrates the method that

can be used to take care of a condition of this sort. The work *A* has been previously machined in the hole *B* and also at *C*, *D* and *E*. It is necessary to grip the work firmly at *D* and at the same time locate it on a plug at *B*. As there is a possibility of a slight variation in the concentricity of *D* and *B*, it is necessary to make the method of holding at *D* so that it will take care of any variations at this point. By using a standard type of three-jaw geared scroll chuck, such as that shown at *F*, the work can be gripped firmly by making slight changes in the chuck. The scroll ring, shown in detail at *G*, must be taken out of the chuck, bored out at *H* and turned down at *K*, so that these sizes are, respectively, $\frac{1}{32}$ in. over and under their former sizes. This permits the chuck to float slightly, and thus equalize any variations in the casting, and yet at the same time hold it very firmly. This method of holding has been used by the writers in several cases with very satisfactory results.

Organization and Management of the Small Shop

BY A. W. FORBES

On page 438 of the *American Machinist*, E. W. Leach under the above title, suggests some methods of planning and controlling production in the small shop. In the last few paragraphs he also suggests some difficulties. However, there is one point in which I think he makes a fundamental error, that is in his assumption that he is to make 300 machines a month.

The distinctive field of the small shop is small quantity production, that is in making articles where the demand is not sufficient for quantity production. Considering the automobile field, it would be folly for a small shop to try to compete with Ford, but a small shop could build special cars to meet the whims of particular customers, as well if not better than Ford.

There are certain things that can be made in large quantities in a small shop, because there is such a small amount of labor on each piece, and when dealing with such practices the methods of the large shop can be used with but little change. The typical small shop practice is making articles one at a time, or at least one lot at a time with but little regard to what kind of work will come next. We are running a small shop making electric motors, but if a man should ask us for a standard motor to run his line shaft we should not think of making it for him. We should refer him to the large manufacturers of motors. On the other hand, if he asked us for a motor to run inside the fire box of his boiler, we would quote on it, probably twice the price of a standard motor, or perhaps a little more. We do make a standard line of motor grinders, but probably half of our work is special in some particular.

I should say that the problems of the typical small shop which the planning should principally consider are:

(1) Flexibility; how can we arrange the work so as to be able to shift the entire force onto a rush order without causing confusion and lack of efficiency; we are not often able to do so, but that is an ideal.

(2) Continuous operation; the small shop demands a higher grade of skill among the ordinary workman than the large shop; it is therefore important to keep the force regularly employed; the item of continuous operation of the machines, that is often discussed, is of less importance than continuous operation of the men; if a shortage of machines occurs it is usually possible to secure the use of one in a neighboring small shop.

(3) Costs; the matter of cost accounting is a simple matter with the large plant using manufacturing methods; if a skilled man is kept for work that only requires one fourth of his time, and is given work for the remainder of his time that could be done by a boy, it is evidently incorrect to charge his wages directly to the job that he is doing; the larger part should be charged to the skilled work on which he spends the smaller part of his time; the small shop has so many irregularities of this sort or other sorts that it mixes up any system.

It was stated above that the small shop requires more skill in the ordinary workman than the large shop. On account of the irregularity of the work it is also true that a higher grade of skill is required in the cost department to obtain accurate costs. But to hire an accountant of greater skill than the large shops is out of the question. The result is that small shop costs are usually based on the judgment of the manager, checked by whatever data he thinks would assist him.

Any intelligent manager knows of plenty of methods that would give him valuable information, but which would cost more than they would save. I am using some forms. I have more in my desk that I expect to use whenever my employees acquire the skill to use them, and I have some that I abandoned when the ones who looked after them left me. I have just resurrected an old card system of giving work to the shop, after three years of non-use. I would have used it all the time if the shop had shown itself able to make use of it.

The determining factor of the small shop is the men who are running it. In the large shop, they may be able to find men who will fit in every given part of a complex system. In the small shop we must fit the system to the men.

Addresses Before Machine Tool Builders

President's Address—General Manager's Report—Jordan on Business Cycles—Flather on Work for Slack Times—Rastall on the Orient—Drury on Conditions in Europe

GOOD addresses featured the twentieth annual convention of the National Machine Tool Builders' Association, held Oct. 18, 19 and 20 at the Hotel Astor, New York, N. Y. On this and the following pages are published in full or abstract the principal papers.

Address by August H. Tuechter, President

In welcoming you to this convention, I do so with the solemn feeling that I am called on to preside at the most important annual meeting the association has yet held. Since last year we have been passing through a period of dullness that is the worst we have had since 1893, and in proportion to the present capacity of the industry is very much worse than any we have ever had. We had four years of false prosperity, due to the war, when our industry was called on to increase its capacity and output far more than we ever dreamed possible. How well it met the call is a record to which we can point with pride.

After the armistice we had a slackening in business which we rather expected, but to our surprise another period of false prosperity began in 1919. However, this did not last long because new orders fell off from January, 1920, and kept slipping down until July, 1921, after which August developed a slight up-turn which however, did not continue during September.

As this depression came on us, I believe that most of us felt that it couldn't last long nor be very bad.

It is sometimes refreshing, and is always valuable, to be able to dig into the past to see if anything that happens now is unusual. Our great statesman, Patrick Henry, said in his speech before the Virginia Convention in 1775, "I have but one lamp by which my feet are guided, and that is the lamp of experience. I know of no way of judging the future but by the past." So it was interesting to go through the records of this association to see what light might be shed on my present uncomfortable position as a machine tool builder and as your president.

To bring it clearly to your mind I will refer to a chart compiled by our general manager from reports of many of our representative members who were good enough to give the information. This bit out of the history of these concerns can be taken, as a fair cross section of this whole industry.

I will read you some extracts from addresses of former presidents at various conventions:

November 1904: Various committee reports indicated that business was not active, and many price reductions had been made. A report was made that the percentage of men employed at that time compared to normal conditions was 61 per cent, and some members reported that they had cut wages 8 and 10 per cent. A table comparing prices of various materials from Jan. 1, 1904, to Nov. 10, 1904, indicated that these had advanced from 3½ to 25 per cent in the face of which machine tools were going down.

May 1906—From Address of Mr. Woodward: We come here leaving our industries, which are teeming with life and loaded with orders, in the hands of trusted people. I may say since last August 1905 there has been a steady growth for the better in the machine tool business. With all the prosperity we have had during the past six months, each member is attending strictly to business, hustling and driving during this time.

Evidently in 1905 business was still dull from the depression that was lowest in December 1903—20 months.

October 16, 1907—From Address of Mr. Woodward: (The big panic came on less than two weeks later.)

Condition of Trade: We have had an era of prosperity, the longest ever witnessed in this country, and this prosperity has been in the extreme to such an extent that we have been overloaded with orders and have strenuously endeavored to execute them. The large and increased amount of business done throughout the United States has necessarily made large demands on capital, and consequently made the interest rate for money high. When money is high the business world commences a gradual curtailment in business, particularly in the manufacturing interests, and this means depression.

Present business conditions in the country seem to me to be peculiar. Our country is in a good condition. In most sections our grain crop is good and brings good prices. There is a demand for more railroads and ships to carry our products. What railroads we have are short of rolling stock and are unable to promptly convey our products, all of which indicate that there is a necessity for more machinery. It seems to me that the amount of money we have in circulation in the United States is insufficient for the large volume of business they handle.

President Woodward, through his long experience, recognized the fact that machine tools were one product in which price had little influence on demand, and commented on this fact.

May 19, 1908—President F. L. Eberhardt:

There has been no time since the organization of our association which has been so important to us as a body as at present. The history of business conditions during the last seven months need not be gone into here except to remark that the least expected sometimes happens. I confidently believe that the worst is past, and with the political horizon cleared, confidence will supplant doubt and normal business conditions return. The manufacturers who are known for their high prices have a great moral, steadying effect on business. They know that their prices, based on true costs, do not bear an unreasonable or unjust profit, especially when one stops to consider the skill required to produce machine tools.

October 20, 1908—President F. L. Eberhardt:

The past year has been making some very peculiar history The various happenings in the financial market, coupled with the political situation has wrought havoc with business for the year. I have always thought that these revulsions of business ought not to be, and by some peculiar control, might be avoided, but the more one thinks about it the more one is forced to the conclusion that they will continue to occur in the future as they have in the past. The peculiar part of it is that, like Jersey lightning, it never strikes twice alike. We are therefore forced to consider basic principles the more carefully and guide our course accordingly. The experience of the past year shows that the profits of busy years must support business during a depression, a fact which the purchasing public must not be allowed to lose sight of.

The depression from which we are emerging started with the larger interests, and it seems to me from observations that can be made, that the clouds are breaking and we will soon look back on the business experience of 1908 as a thing of the past, but don't let's forget the lesson.

May 1909. There were numerous reports of price

reductions at the meeting, showing that demand was still low. Touching on the activity in railroad shops, one speaker stated that while there was not wide room for improvement, the increased earnings of the road gave promise of some rapid strides ahead, which it was expected would soon close the gap of idleness left by 1½ years of industrial depression.

October, 1909—Mr. Eberhardt: Six months ago we only believed the trade corner of the business depression had been passed. Today we are sure of it.

May, 1910—Mr. Kearney: It is probable that the machine tool industry was never in such a prosperous condition as it is at this time, and it owes much of its prosperity to the influence of the Association, which brought out an interchange of ideas which has resulted in a broader education for all of us as regards some of the essentials of our business.

October, 1910—President Geier (Only five months later):

Since our last convention in the spring time we have experienced a little change in business conditions, and yet, while we have had a little lull, I hope that you are filled with hope and optimism and that you feel that the future is as bright as the sky is this morning. It is my belief that we are about to enter upon a substantial period of activity. Although we may have a recession here and there, the curve is upward, and I think that this association will be able to educate its members so that we shall always be able to take a long view forward, and when a little depression comes we will not lose heart and be ready to disorganize our business, but rather become philosophic and appreciate that such conditions are simply temporary.

May, 1911. (President Geier had to admit that he made a bad guess.)

We have been going through a period of tribulation. We in our business have been trained to stand trials and tribulations, and the skies certainly are clearer today than they were a short time ago. These periods of quietude should bring to our minds the necessity of most carefuly studying our households, to analyze every department with the purpose of bringing them to a higher state of efficiency, looking toward economies possible to be effected by which we shall be better prepared than ever before for such conditions as we are now passing through.

In October, 1911, the depression was still on, and evidently deeper, because President Geier said:

I am very glad to see this delightful, bright, sunny weather, because there have been a few clouds hovering about our business offices and it is a good thing to get out of the clouds and out of the gloom and go to a place where the sun shines.

When these depressions come upon us we feel that we are stung a little bit, and when there is an unusually vexatious one we feel like complaining a little more than otherwise. But let us not forget the sun is shining and that things are not as bad as they seem to be. Better times are still in store. Let us not become disheartened. I hope this meeting will serve to buoy us up and I hope we will realize that things are not as bad as they seem, but that they might be a good deal worse. Sometimes I think we are apt to be too sensitive and allow things to get on our nerves more than they should.

In May, 1912, the depression was over. At this meeting Mr. Hildreth brought out a chart showing the rise and fall of pig iron prices, which of course correlated closely with the rise and fall of demand and pig iron production. He indicated that the industry must anticipate these periods. It was a very good paper. It only gave the experience of three machine tool builders, because that was all that he could get figures from. The chart was reproduced and printed in the proceedings of the Association, but was "seed that fell by the wayside and was trampled under foot."

October, 1912—President Bullard: The year past has been one of progress. Crop reports and business conditions throughout the world indicate that the prosperous times predicted by my predecessor, Mr. Geier, are upon us.

By October, 1913, business had again begun to go off, since President Viall said, in May, 1914:

As far as business conditions are concerned, many, if not all of us, are working under subnormal conditions, and we are hoping from week to week that there may be a pronounced change for the better. While a hopeful frame of mind does not pay the bills and allow us to employ our full quota of men, it does help us to plan for the future and take those steps that will help not only our own but the general business industry when good times come in. It is to be hoped that none of us, ostrich fashion, will hide our heads, attempting to conceal from ourselves the true state of affairs, but it is to be hoped that when new plans are brought for your consideration that you will consider them with confidence, with the idea that some day our country will be back where it belongs under normal conditions.

October, 1915: President Viall reviewed previous conditions as follows:

Business had begun to go off somewhat at the time of our annual meeting in 1913, and the depression that had set in, not only with our own industry but with all other industries, had begun to deepen. In April, 1914, you will remember that our convention was in a way trying, though we were all endeavoring to see the bright side, and to estimate the time at which our business would take on a color that didn't need rose-colored glasses to give it a proper shade. We all felt that business would revive some time, but when it would revive was a serious question. We were all putting up stock, and many had come to the point where they felt that they could not afford to increase the accumulation of stock goods.

At the October meeting last year (1914) some of us had begun to get very busy, and we were very keen to follow all scents that led toward a discovery of persons holding orders. Few of us at that time had any idea of what was in store for us, many of us were running short-handed, and the occasion had not yet arisen to warrant adding to our forces and in many cases to our hours of operation.

When we met this spring (1915) all our plants were in full swing, crowded in a way that we had never been crowded before, and we were compelled to reject orders that were offered simply because we were not able to take care of customers. We now find ourselves busy. Hardly a section is without distinctly disturbing labor troubles.

Through all these changes, and oftentimes periods of dull business that are more trying for an organization of this character to live through than are periods of prosperity, our membership has held together well.

October, 1916—Mr. Doan: In the United States there has been immense business development during the last two years. Old machinery has been put in shape for working, and new machinery has been built with break-neck speed. New buildings have been erected, and expansion has been the order of the day in the machine tool industry, along with others. Our demand has been due to the numerous calls for machinery and supplies of every kind from Europe. But this Hercules at work will grow weary—will there then be sufficient demand to keep all busy? In the stress of unprecedented prosperity, let us not forget to prepare for other days.

The members of this association are all optimists, but unless we discourage new entrants into the business of those untrained, many of them would easily become pessimists. Let us keep the business sound; let us plan to keep it steady; let us plan to keep it permanent.

I hope that no one feels that I feel pessimistic at all about present business conditions. I don't. In fact, I think that the immediate future, or rather as much as we can reasonably forecast—perhaps the next year—is almost assured. You all know that business conditions change in our industry much more rapidly. We have all seen changes occur from one month to another. Therefore I think it an opportune time when we should look very carefully into the future.

October, 1917—Mr. Doan: This war will end some time. No man knows when, and then the business man with the

large plant and large payroll will have some real difficulties to solve, requiring clear vision and courage. A prophet may indulge in predictions based on natural laws and past experience. Without, however, making any attempt at prophecy, I want to direct the attention of this membership to the fact that during the last three years there has been built about the same number of machine tools as would ordinarily be built in ten years. Therefore, I ask you how long it will require the world market to absorb its over-supply, which even now is apparent in some kinds of machine tools? Mind you, I am not predicting—simply calling your attention to a condition with a view to having each manufacturer answer the question as best he can; but I would also like to add the old warning, "The good sailor trims his sails for a squall."

At this same meeting there was also an address by Geo. F. McElwain, of Babson's Statistical Service, explaining the well known Babson charts. During the course of his talk he said:

When the peak of the war period is reached, we are going to start to go down into a period of final depression which will mark the close of the war, which will include all the warring countries and most of the neutrals. This period will take us down into a depression such as we have not known in civilized countries for a great many years.

May, 1918—Mr. Doan: I desire to direct the attention of our members to the fact that in the small sizes of machine tools, the supply is greater than the demand. There is, however, a scarcity of the larger sizes of machine tools, most of which are wanted quickly.

December, 1918—Mr. Doan: The period that we are entering into is perhaps slightly cloudy, at least taking the immediate future, but I feel certain that every cloud has a silver lining, and time passes very quickly, and we will soon pass through this uncharted sea and we will have good business again.

You realize that the war is over, and that the government will not need many of these machine tools. On the other hand, the problem is serious; we have so many, many machine tools in process of construction, so much on order in the way of material, that it begins to be a very serious question.

At the same meeting, Mr. Geier: We surely appreciate the rays of hope and light that have illumined what seemed to many of us a rather dark horizon. There is a surplus of machine tools confronting us to the amount possibly of $200,000,000.

The war made it necessary that the machine tool interests be expanded from three to five times in order to win the war. The machine tool industry did this without a cent of subsidy by the Government; not entirely without profit, but they did not make the money that some people think they made; without Government contracts to any particular extent; without any guarantee contracts. Their personal aim was to give every ounce of energy in building up their business as rapidly as they could at their own expense in order that the war might be brought to a successful conclusion.

Under the direction of Government officials they did this, believing, as all the nation believed, that the war would extend well into 1919. They find themeslves at the present moment going at a tremendous rate, with obligations all down the line, extending over the latter part of 1919. Suddenly, six months at least in advance of any opportunity of taking off their shifts or using the raw material or disposing of the unfinished goods in process, they find tremendous surplus of finished product which may possibly equal twice the probable demand for 1919.

May, 1919—Mr. Newton: The principal thing we as an industry are interested in is the present and immediate future of our business. The present situation is not one that will lead us to become recklessly optimistic. On the contrary, I am fearful of the reverse condition. Many of us were members of the association during the trying times occurring between 1908 and 1914.

In October, 1919, business was thought surprisingly good, because in May, 1920, President Newton said:

At our last convention we were rather surprised that business conditions had held so favorably since the signing of the armistice. We had been promised, and most of us had looked forward to a real depression, at least in our line of industry. Fortunately, things have turned out quite differently. We have experienced, instead of a depression, a most successful and easy selling market.

Today most of us are confronting a shortage of new orders, although we have plenty of unfilled orders on our books. I am looking forward to the resumption of good business conditions in a few months. In other words, if we are to have a business depression it will be of short duration.

October, 1920—President Newton: For the past few months business in general has been on the down grade, attaining greater velocity as the time went on, so that now, even if the brakes were set hard, we cannot expect to stop the downward trend at once. Therefore, let us face the situation as it is and realize that we are face to face with a real depression, and that the orders for machine tools are few and far between.

Most of us know from past experience that the demand, or lack of demand for machine tools is entirely beyond the control of the machine tool builders. The depression which we are now contending with is no new experience for us, and is not a surprise, as we have been expecting it for some time. In 1915 and 1914 we experienced a situation in the machine tool business very similar to the one which we are now passing through. That experience taught us the real value of our association—a value that has never, and can never be too highly rated.

Let us attack this depression as though we thought it would last for some time. Let us conserve our energies, meaning cash, so that if we have cause we shall be able to meet conditions in a businesslike manner, and then we shall be ready to resume our full productive capacity when the demand comes back to us, as it surely will in the not very distant future.

In view of these extracts, though we may without shame be surprised at the depth of this depression, ought we not be ashamed if we feel it to be anything unusual? An industry that has had seven slumps in 21 years ought to have its eyes open, and be ready for one almost any old time.

Now, then, let us not make this same mistake again. We have a thoroughly competent observer on watch (the new general manager of the association) who will warn us of shoals ahead and of clear sailing, of the rise and fall of our business barometer. Let us now do the things necessary to help him correct and revise our barometer. It is ours—for all of us—but some don't know it even exists. Some prefer to sail without it. Some will not help, either through lack of knowledge or fear of damage to their own craft.

As the members know, before his selection as Secretary of Commerce, Herbert Hoover, as chairman of the American Engineering Federation, asked a committee of distinguished engineers to estimate the amount of waste in industry, the object being to call the public's attention to the sources of waste and to arouse industry to the necessity and profit of eliminating waste.

The Percentage of Waste

Fred J. Miller, former editor of the *American Machinist*, was active in this committee and asked the association's assistance in making some studies of the machine tool industry. This assistance was given, and the investigation seemed to show a probable waste of about 40 to 45 per cent. The report of the committee is very interesting, and it shows that in the machine industry not a large proportion of this waste can be chargeable directly to labor restrictions; therefore, the responsibility for elimination of waste in the machinery business rests largely on the shoulders of management.

There is a very large excess of facilities that are not used to the fullest extent. There is badly planned

management. Efficient planning and guidance of production is the duty of management. Better employment service and policies lie within the power of management, and not of the employees.

The old proverb says that a dollar saved is a dollar earned, and I recommend to our members that we ourselves look to every opportunity to save waste in our own shops—wastes of every kind in plants, in time, material, organization, and costs.

Since our Cleveland meeting, Scovell, Wellington & Co. have made cost surveys for a number of our members. The cost work of the association should be continued until the members are all found to be figuring the proper elements of cost. Unless they do so they have a false basis on which to base their prices. The man who does not charge enough into his costs is very prone to make mistakes in his prices, and his cost system should automatically provide for the proper charges. Most of our men can easily get their labor and material, but the burden distribution is the part of cost-keeping that presents the most difficulties, and many people are inclined to neglect it just because it seems too difficult.

Those members who have not yet had the survey made of their plant should do so, and should consult with the accountants as to what parts seem to be deficient in their system to bring it in line with the uniform plan adopted by the Cleveland convention.

Necessity of Cost Accounting

If all of us had used the device of calculating a normal burden, and putting away cash reserves in boom times to carry over depressions, our industry would be in a much healthier position than it now seems to be. Several members have written that they could not spare the money it would cost to attend this convention. Is that not evidence that there is a necessity for some of this cost accounting work?

The most promising, the most necessary activity which the association has undertaken this year is the organization of statistical service for each group of tools for which it is possible to render such service.

We are all familiar with the very great irregularity to which this whole industry is subject, and this excessively high war peak certainly is significant. If the law of action and reaction applies in business as in physics, the industry seems due for a very long reaction to compensate for the excessively lively action that we had during the war.

None of us can judge our wisest course merely from our own experiences with anything like the soundness we could have by pooling our information through a statistical service. Other trade associations find this to be the most valuable service they can render their members, and I personally am fully convinced of that fact. The whole world gains much from the monthly reports of output that the iron industry has published for many years. All industry is closely related, and by proper study and interpretation of conditions, it will be possible to better stabilize industry, to have ready for the consumer all the goods that he needs, and not to have an excess of goods when the consumer is not likely to need them. The lone manufacturer confronted with such a business situation as we have now is groping blindly if guided only by his own knowledge. He is much more subject to losses than if he had full information as to the total current output and sales of his particular product, together with reliable information as to finished stock on hand, the amount in process, and the rate at which this stock is moving out. It is very valuable when these items are compiled, to compare one's own experience with the consolidated figures for the whole group. Each can determine how his own sales compared to those of all other producers as a group, and how far he is justified or not justified in making special sales efforts.

It is of the greatest value at this time for each group to take its shipments for the last twenty years, as some groups have done. We are thus able to form a pretty fair conclusion as to the pre-war trend, and in the light of that, to plan intelligently our policies in the future. This composite curve before you is significant, but is not as valuable as the group curve showing your own products. Then with the monthly reports and charts for each group, the actual flow of business in the group is very well seen, whether it be good or bad. Without it, you can only guess; with it, you can reasonably estimate.

Benefit of Co-operation Between Industries

Our own statistics of this sort can be made of great value to the country because indications are that our own slump in any period of depression precedes a general business slump by some months at least, perhaps by a year. In exchange for this information from us we can hope to secure similar information from other industries whose activity precedes ours on the rise. Then we will know the right time to make stock and to get ready for the prosperity that will occur during the following cycle.

Such co-operation between industries depends on co-operation between individuals in each industry. Such work cannot be done by any individual alone. In such co-operation lie great possibilities of benefit to all members of a group.

A promising innovation in the association's work has begun this year by holding two series of regional meetings. One series, conducted by Mr. Scovell of the Scovell Wellington & Co., discussed our uniform cost plan, and the second, conducted by our general manager, discussed general conditions in the industry. Letters that come into the office commend the work in these meetings in the highest terms.

The work of an association must necessarily be informational—that is, it must gather and spread information. Regional meetings should be a part of our program from now on. At these meetings not only should the heads of the concerns be present, but they could well have present the men known as junior executives, who are in responsible positions, and who gradually grow up to be heads of concerns. The education of such men in the broader aspects of this business can have only a good effect. The principles and the difficulties underlying the development of this industry might well be laid even before the workmen, who are prone to think that the bosses never have any troubles.

There are many possibilities in these regional meetings and they can well be developed.

For many years this association has talked about the possibilities of standardization. The time now has come to stop talking and go to work. The American Society of Mechanical Engineers has taken up a number of subjects that directly concern the machine tool builder, and we shall have to be represented on committees on these subjects.

A recent letter from Sol Einstein, chief engineer of

the Cincinnati Milling Machine Co., who is now in Germany, says that the German machine tool builders are very busy with standardization work. I do not need to go into this in detail. You know it is needed, for many reasons, and each committee should seriously and promptly formulate opinions as to what things can be standardized and then go into the work of standardization itself.

The general plan could be to have a general committee of the association which can make recommendations to the Engineering Standards Committee. Each machine group should have a special committee on standardization which would report its findings to our general committee, for transmittal as above mentioned. This is the practice of other organizations. We should take our proper position on these matters. If we do not do this work ourselves as affecting our own interests, we will have no just cause for complaint if some others attempt to do it for us and then do it badly, for lack of understanding of our problems.

We should not let the matter lie as we have heretofore, but we should make this a very vital and active part of our association program. It will finally be a very profitable undertaking, as has been demonstrated with standardization work in other fields.

I consider it necessary that I at this meeting of the association make some reference to the National Association office which has been open in Cincinnati since Jan. 1, 1921. To get the office into shape, properly equipped and running, was naturally the first task which confronted Mr. DuBrul, and with this accomplished he went to work with a vim and vigor which must be seen to be appreciated.

Report by E. F. DuBrul, General Manager

IN THE 20 years of its existence the Machine Tool Builders' Association has done good work, but compared to much younger associations, its activities have been limited. Many activities now successfully pursued by other organizations can well be followed by this association. The necessity of other work beside good fellowship and acquaintance among competitors, has led many trade organizations into much more active work.

The Machine Tool Builders' Association has done extremely well in the matter of cultivating good fellowship and confident knowledge that the word of one's competitor was good. When the association was organized a machine tool price list meant nothing except the salesman's maximum limit; today, in spite of the depression that exists in the business, a machine tool price list means just what it says, in the vast majority of cases. The ethical standard of the machine tool business on that one account is vastly improved over what it was 20 years ago. Such a betterment of ethics would not have been possible without the good fellowship and confidence that this association has brought about among competitors.

The association's co-operative work of the past should not be minimized, but now the conditions are such that unless co-operative work of a much higher type be undertaken in more and newer ways, the association will fail of reaching its highest value to the members, who are paying for its operation.

I have tried to make it plain in bulletins, in the regional meetings, and in the Cleveland Convention, that association work should be regarded by the members as a strictly business proposition. The association will be more and more successful the more the members so consider it. They should weigh its worth to them against the dollars they pay out for it. Unless they do so look upon it, they will not co-operate in the things that they are asked to do. Those who seriously regard the association office as just as much a part of their every-day organization as though the association office were under their own roof, will co-operate to the fullest extent and will be repaid many times over.

The economic upset the world has been going through and the present depression in the machine tool industry, require real service along economic lines. This is no time for puttering with business problems. On the other hand it requires of every man, the deepest thought, and most serious study, if he would keep his own business and his industry in a healthy condition.

With the approval of your executive committee, and its advice and assistance, I have tried to proceed along broad lines of constructive work, just as fast as the members were inclined to follow.

Distributing Information

Co-operation through an association brings results like the multiplication of the loaves and fishes, in so far as ideas are concerned. If one member gets a good idea, but keeps it to himself, it does not multiply. If through the association his idea is spread broadcast, it benefits the whole industry; thereby it reacts and benefits the one who first got the idea. He not only has not lost anything himself, by giving forth this idea, but he has multiplied its value many times when he has given it to 200 other members. If it also induces someone else to give out a good idea, all the 200 then have two new ideas instead of only one man having one idea. You all turn ideas into dollars.

Since January we have sent out sixty-six numbered bulletins and some letters that were not numbered, altogether perhaps ninety general communications addressed to the membership. These covered many different subjects, and some of them seemed rather long. There is always a tendency, when you receive a long communication from an association office, to lay it aside until you get more time to read it, and then to forget it. Every bulletin is not going to be of equal value to every member in the association, because every shop is different. So many important subjects have been cropping up that we questioned whether we might not be sending out too many communications. The president sounded the membership in that regard with a general letter over his own signature. The kind and number of responses received indicated a desire for all the information possible that looked in any way helpful, and proved that the members would rather be their own censors, preferring to get too much rather than lose by not receiving enough material of special benefit to them.

It is to be desired that every member will take these communications in the spirit in which they are sent; that is, the spirit of helpfulness.

If any communications have appeared to be a bit strong please understand that it is because this industry has reached a very serious stage as a result of post-war reaction and because some men are doing things that are futile, useless, and disastrous.

It is not in a spirit of carping that I may put out a bulletin that sounds rather sharp. It is with the idea of strongly calling attention to situations that have become very plain to me, as I have had the opportunity to survey the whole field, but which are not so plain to

a manufacturer who does not have the same opportunity to picture the industry as a whole.

The member who gets a bulletin that strikes him as too strong should first frankly consider whether or not the bulletin touches on his own conditions. If it does, he should then consider if it would not be well to eliminate the condition that the bulletin is pointing out and that the condition may demand strong medicine, and not a homeopathic pill. If he finds after careful analysis that the bulletin does not in any way bear on his own business, let him, in charity both for the manager and the members who do benefit by it, realize that it was sent out for the purpose of helping some others, and was not intended to rub anyone's feelings the wrong way.

Statistical Work for the Various Groups

It is well demonstrated by many trade associations that the most valuable service that can be rendered is to gather and distribute statistics of production, shipments, stocks, and sales. Without information of this sort, each manufacturer must simply grope blindly in the dark, making the wildest kind of guesses as to conditions that he must meet. The poorer his information of a general situation, the worse his guess is likely to be.

Every man wants to know and should know whether he is getting a fair share of what business is going at any time. He can tell this only if he knows the total volume in his line being sold in a month. If he knows that the present state of demand is only fifty machines a month, and if he knows that he is getting his share of that limited demand, he will not be tempted to do things that compel his competitors to enter cut-throat fights for business. But if he is ignorant of the true facts he is pretty sure to do something that will work against his own pocketbook and every one else's, including the consumer's.

In no other way can he know, except by joining with his competitors in compiling a composite report of the conditions. When he has that report he can then set his own conditions alongside not only of the condition of the group as a whole, but of his competitors as a whole with himself excluded.

To develop that sort of information for each group, we are organizing monthly statistical services by groups, of orders, cancellations, production, shipments, factory stocks and dealers' stocks. The shaper, radial drill and upright drill groups have already put this regular service into operation. We wish each group to consider this at the group meetings tomorrow, and hope all will get in line so that they, too, will have the benefit of better information as to their own markets.

Some groups have a picture of their past from which they can guide their future because they have gathered statistics of shipments for the last twenty years. While these are far from complete, they are fairly typical.

One reporting group found that of certain sizes of machines the factory and dealers' stock is sufficient to supply demand, at the current rate, for something like thirty-six months. Can any man think that to be a healthy condition? Remember that those stocks were accumulated at high costs, and now have to be liquidated in the face of much lower replacement costs. The difference in cost went to the workers and the material men, but it will never come back into the bank accounts of the men who accumulated those stocks in over-anticipation of their demand. If they had had this sort of service in the last two years they would have real money in good, select investments bearing high rates of interest and increasing in value. Instead, they have it tied up in stock that not only earns no interest, but costs interest to carry, and besides creates loss and demoralization, as overstocking always will do in every industry.

An illustrative flow chart is presented to show the form these group charts are going to take, one for each size of machines a group chooses to report on. A manufacturer should be glad to join with every competitor in the compilation of figures of this sort, because it gives him a much better guide for his policy than he could have in running by mere guesswork, as he must do without such information.

Charts of this kind show the trend of the forces of demand and supply at work every month. Every group can use statistics of this sort, the details and the method of compilation being arranged according to the needs of the group.

Is it not plain that when an industry as a whole provides far more production capacity than the demand of its customers justifies, that industry is not going to pay a reasonable rate of return on the investment so made? True, some individuals in a group might generally be able to earn a fair return on their own capital, but when demoralization of price occurs, because of blind guessing on the operation of economic forces, even sound, well managed concerns cannot hope to make the earnings that their efforts and capital at risk really justify, and knowing it will be able to keep their own business in sound condition. Naturally, if all, or a great majority are doing the right thing, the industry as a whole will be healthy; but if a majority are doing the wrong thing, all will suffer.

The Barometer

The barometer chart figures that we have been issuing every month are very far from being as satisfactory as they can be made. As I have said at the group meetings, a feather thrown into the air will indicate the wind's direction better than nothing at all, but it would hardly serve the weather bureau, to measure and record wind velocity and direction accurately enough to predict the general course of the weather.

From various curves drawn to show shipments of the past twenty years of different sizes of various tools, we can now say that this industry can construct a first-class barometer for itself, if it wants to. This can be done, and at slight cost, but it will require co-operation by the members. Such a barometer can and should be made for each group if the group statistics are better organized and better appreciated. In addition, a general barometer can and should be constructed for the industry as a whole and it can be done very easily.

A grave defect of our present barometer is its basis of dollar values taken on the high prices prevailing in the first quarter of 1920. Another defect is that it is an average of percentages that have no common base. About half of our membership are contributing their figures to this barometer and I should like to see their faithfulness better rewarded as it can be, if the contributing members will assist.

Since our Cleveland Convention, even perhaps before, our member, Mr. Oesterlein, made a suggestion that I believe will greatly improve the general barometer. That suggestion is, that each member report unit orders received each month, giving the number of machines

ordered and cancelled, and the balance of unfilled orders, report blank being arranged to show the value of machines sold in classes according to a scale of values to be decided upon.

It is fairly evident that the lighter machines are most sensitive to rising demand because they do not require buyers to make much cash outlay and such types naturally are the greatest in numbers sold every month. We have no sufficient evidence on which to base a fair presumption that as the lighter machines precede the heavier ones in activity on a rising market, the heavier ones show a slump coming long before the lighter ones do. Therefore the interests of builders of heavy and light machines are mutual in pooling information as to the course of the general market from month to month.

As a basis of discussion, it is suggested that reports be taken, as follows:

(*a*)	Machines sold to the customer at	300.00 or less	
(*b*)	Machines sold to the customer at	300.00 up to	800.00
(*c*)	Machines sold to the customer at	800.00 up to	1,500.00
(*d*)	Machines sold to the customer at	1,500.00 up to	2,500.00
(*e*)	Machines sold to the customer at	2,500.00 up to	4,000.00
(*f*)	Machines sold to the customer at	4,000.00 up to	6,000.00
(*g*)	Machines sold to the customer at	6,000.00 up to	10,000.00
(*h*)	Machines sold to the customer over	10,000.00	

Curves of each of these classes would clearly show the trend of business. Low interest rates precede activity in pig-iron production, with which we now know the machine tool demand to be closely correlated. With such curves we will then be in a fair position to forecast the movement of machine-tool demand. If we find the small machines becoming active, we can send out to the whole industry the glad tidings that the clouds are breaking. We know that long before a general boom is at its height interest rates go up, and the heavy types of tools fall off in demand, for very well known reasons. When we find this to be showing up, we can hoist a storm signal for the industry, so that all can reef sail.

If the members will take the very little trouble required to make the reports the association can easily give all a fine service, at a cost that is negligible compared to the benefit.

I strongly recommend that some action be taken along this line, the change to be effective beginning with January next. This would give the members time to get their records in such shape as to enable them to report on whatever basis is adopted.

I have shown our results to other workers along these lines and they give our industry credit for being able to forecast coming depressions with remarkable accuracy quite a time in advance of most others. Exchange with other industries that forecast an advance will be to our benefit. It only remains for us to perfect our own statistical service. I am confident that an industry which did so much to help win the World War, will not fail in rendering the large service to itself that this work will render when fully operating.

What Can Be Made in Idle Machine-Tool Plants During Times of Slack Demand for Regular Products

By H. L. Flather
Treasurer, Flather & Co., Inc., Nashua, N. H.

PROBABLY no one thing causes machine-tool manufacturers more concern than the problem of keeping their factories busy during slack times. It seems presumptious on my part to attempt to be the Moses who can lead you other machine-tool builders into the promised land and show you how your factories, which are now more or less idle, may be put into profitable operation, when I have never been able to do it with our own.

Some thirty-five or forty years ago, when I was a boy I spent an occasional vacation with an uncle on a farm. Now while this uncle was one of those men whom children love to visit, he was not what others would call successful, especially in his line of work. In fact, he had all he could do to make a living. However, regardless of his faults, he possessed one faculty or talent, and that was the ability to see and point out the mistakes of his fellow farmers. He could show, theoretically at least, their every fault, and also how if they would only follow his advice they could not help but be successful. Some of my friends who knew me best have at times intimated that I resemble my uncle in some respects.

If any of you here came with the expectation of my being able to tell you of a plan that will change an idle shop into a busy one, I am afraid you will be disappointed. After careful thought I have concluded that about all I can do is to copy my uncle and point out the faults and mistakes, as they appear to me, of what has been done in the past, not only by our company, but by some others with whom I have been more or less acquainted, hoping that by taking the negative side something may develop in the discussion which is to follow that will be of real benefit to the machine tool manufacturers in times like the present.

My first experience with a business depression came in 1893 and I haven't missed once since. I also feel more or less acquainted with the depression of the seventies through hearing it talked over and discussed by the founders of our company. On account of the many hardships endured and the ways and means used to keep our company in existence, the panic of the seventies was ever a live topic in our family, and although there were only about six lathe manufacturers at that time, the problem of how to keep alive was just as serious then, possibly more so, than it is today. The same difficulties existed then as now, so there is in reality nothing new to face, except to find a better way of overcoming them, and it is regarding these that I have theories of what we manufacturers should and should not do. You will notice I say theories, because after having been actively engaged in making machine tools for over thirty years, I only *know* two things, the rest is all theory. The two things referred to, are, first that in dull times it is next to impossible to make money, and second you can make a tremendous loss unless the greatest care and foresight are exercised.

Speaking for my own company, I can say that in the past we have done about everything to keep the wheels moving. Some years ago, our company purchased from a manufacturer located in a small city some distance away, a single purpose machine and I was sent there to learn to operate it. Not knowing anything about the hotel accommodations, inquiry was made of a friend who traveled that territory as to which was the best one, and he replied, "There are six, but whichever one you go to, you will wish you had gone to another," and it is the same way with dull times—whatever we do we wish we had done something else. We have run on short time with practically a full crew, we have run full time with a reduced crew, and we have shut down entirely. We have built up stock when we wished we had not and we have kept our money in the bank when we wished we had it in stock.

We have made an endless number of mechanical contrivances, including the first type of bicycle, familiarly known as the "bone-shaker," have made many patented articles, including flat-irons, horse shoes, even jack-knives with a blade for every conceivable use, designed many original machines for special purposes and also built them from designs furnished us; but I think without exception that in the long run each venture was a mistake and money loser. In all such cases a great deal of time and energy must necessarily be consumed which can not be accounted for in preparing to manufacture something greatly dissimilar to one's regular line, and unless the manufacturer is exceptionally fortunate in having executives of unusual ability, the probabilities are that many of the ways first tried to produce the new product will not be successful, necessitating starting over again, at least once, if not more times. If it were possible to use the same energy and ability in improving one's regular line, the financial benefit would be much greater.

Many manufacturers take on special machinery and sometimes this works out to advantage, other times not. I will cite two examples, one which was a success, and the other a failure. For a successful example I have in mind a manufacturer who commenced years ago to make special machinery used in a food industry and due to a combination of unusual circumstances had made a success of this business. First, owing to a universal and constantly increasing market for this particular food, the demand for this special machinery is practically constant, and second, to being located where he has no competition. In this one case the side line has outgrown the original. The tail has wagged the dog. On the other hand, I know of instances where the building of special machinery has lost to manufacturers business in their regular line, because the machines have not come up to the customer's expectations and regardless of the fact that he was not at fault the machine-tool builder was held responsible. It is needless to add that in such cases the manufacturer would never again receive from such customers consideration in the placing of future business, either for standard or special machines.

My unsuccessful example is that of a machine-tool builder who by hard work had established for himself a fairly good name for his particular line when one of these depression cycles swept over the country. Not being any too strong financially, it was necessary for him to keep his shop in operation if possible. A plausible inventor happened along at this time and the shop owner was persuaded to undertake to manufacture a machine which, according to the inventor, would revolutionize a certain industry. As is usual in nine out of every ten of these cases, the machine turned out to be fundamentally wrong in design and became a failure. Nevertheless the builder was blamed by the inventor, payment was withheld and a long law suit resulted. Eventually the machine-tool builder won the law suit but it practically cost him his business. During the time the law suit was on he had to neglect his regular line. Meanwhile normal conditions returned in the machine-tool business and he was unprepared to take care of his agents and customers and by the time he was, they had gone elsewhere. Further, when he came to the actual manufacture of the special machine he found that his regular machinists were not adapted to the new work and he had to hire some that were, and by the same token, when he returned to making his regular line he had to change once more, and his old men having found positions elsewhere, it was with great difficulty that a new set of competent men was secured. The final result was that although the machine-tool builder recovered the cost of the special machines, the amount did not offset his loss in other directions and he became financially embarrassed and forced to liquidate.

In considering these two cases the critic may say that success or failure was simply a matter of foresight and business sagacity, but I do not think that is the correct answer, because I happen to know that in the case of the successful manufacturer the special machinery was taken on simply to tide over during a slack time and the future expansion was not in any way due to ability or foresightedness. In the case of the manufacturer who failed I also happen to know that he did not depend on his own judgment but sought the advice of others. The consensus of opinion of them all was that the invention apparently had great possibilities and if it made good there was a fortune in it. Some may even reason that it is best to distribute your eggs among many baskets, but personally I agree with Mark Twain, who said, "Put all your eggs in one basket, but watch that basket." If you once decide to make machine tools, stick to them.

My own conclusion is that doing work foreign to one's regular line is unprofitable. There is, however, one exception which I wish to make and that is the taking on of comparatively simple work, requiring little or no supervision, at a fixed rate per hour. This enables a manufacturer to keep his organization together and cuts down the overhead. The fly in the ointment in this proposition is to first obtain the business. In dull times there is very little of it to be had anyway and what there is, is generally given to contract or job shops which make a specialty of doing this work both in good times and bad. Still our firm has always been able to secure some and in thinking the matter over, I recall that most of this kind of outside work has been confined to planing. Such being the case, I would suggest that our members look into this and see if they cannot develop something locally, especially those who have unusual planer equipment, such as exceptionally long or wide planers. Because of our firm happening to have an extra wide planer we were able recently to secure on an hourly basis some work right in our own city that amounted to about two thousand dollars.

Every depression occurring in my generation has been brought about by a different cause, over-speculation, politics and the World War all playing their part; and no two depressions have come about from the same cause, so that the lessons we learn from one cannot be applied to another. If the present depression were caused by the same conditions as the one of 1893, or if the next one will be the result of another war, I am sure we could apply to advantage the knowledge gained in the past, but as each depression was the result of entirely different causes, the lesson we learned in '93 is of very little value now.

You may think that I am straying from my subject, and perhaps I am, but the point I am trying to bring out is what we should do with idle shops in dull times depends a great deal on the cause of dull times. For example, if world conditions today were similar to those existing in '94 and '95, I should advocate running our plant to capacity and stocking, if necessary, all the machines we could make. On the other hand, if there should be another World War and I am unfortunate enough to be alive at that time, I should commence to

curtail with the first rumors of peace and not stock a single machine.

As I said earlier in this paper, my actual knowledge of what can be made to advantage in a machine-tool shop during slack times is very limited, my experience having grown only a crop of theories. I do think, however, that if you take on outside work or special machinery, it is much better to confine the new work as closely as possible to the line in which you are already engaged. Sometimes, even what seems like a small change from the regulator, will cause a lot of trouble, as perhaps the following illustration will show:

During a semi-slack period some years ago a firm in a nearby city placed its order with us for what seemed to be nothing more than an ordinary lathe with a turret on the ways and another on the carriage, it being thought by all that a machine of this kind would handle a certain part to perfection. After the machine itself was made the job of tooling it up and testing it out was given to me. Of all the deceitful things which I ever encountered, that piece of work was the limit. I worked on the job for months until I fairly hated the very sight of it. Finally we hit upon a new scheme for tooling the work up and by hard work I finished the tools the night before I left on a vacation, sure in my own mind that they would be a success. Upon my return, almost the first words my father said were, "Son, I am glad you are back, those last tools didn't work and the machine is waiting for you to try something else." Eventually, after we had spent in experimenting several times the original price, the machine was accepted and we charged the loss up to experience. Having expounded my theories regarding what shouldn't be done in slack times, possibly you are wondering if I have any theory as to what should be. I have one, but I hesitate to tell it, as it may be thought idealistic and visionary. However, I realize that if it is, there is no better time or place to submit it for criticism.

Successful Shop Operation

To operate a shop successfully in dull times you must be able to do so in good times. That statement may sound like pure nonsense at first, but before passing judgment let's analyze it for a moment. What constitutes successful operation? Does the mere ability to secure orders sufficient to make a profit when business is good constitute successful operation? I claim that that is only partial success. We all know without my going into the whys and wherefores that the machine-tool business can be operated at full capacity only at certain periods or intervals of more or less duration. That every so often we are confronted with a cycle of depression, caused by conditions beyond our control. That in spite of our being a fundamental industry, the one in fact, on which the world today is dependent, as it is on no other, yet it is also a fact that what profits there are, are made only during good times, and to make ends meet at others it is necessary to resort to extreme measures.

My theory is that the price at which machine tools are sold when there is a market should be sufficient to return a profit great enough to pay a reasonable dividend annually, good times and bad, on the capital invested, and in addition take care of the ordinary expenses during dull times. Hence my idea of operating a shop successfully in good times is to see that we obtain that price, and if we do, we shan't have to worry so much about the dull times.

The Business Cycle

By David M. Jordan
Assistant Professor of Finance, New York University

I AM not here to try to tell you it is possible to foresee what is going to happen in the business world. It cannot be done except relatively speaking, but it can be done to a certain extent. We have to get down to fundamentals to see how business swings and why it swings. We have known for about 100 years that business conditions more or less move in cycles. Business swings around the cycle from depression to recovery; from recovery to prosperity; from prosperity to liquidation, and back to depression again.

I want to follow the cycle around with you for a few moments. We will start with production. Production and distribution are the biggest things in business, and production is first. Production may be divided into two classes, agricultural and industrial. In that way I will say that everything which is not agricultural production falls under the classification of industrial. Distribution, or marketing, depends largely on production. I think it is folly to study statistics of marketing because marketing shows the effect, not the causes. All through this matter of prognostication of the future, differentiate between cause and effect. If we want to look ahead we have to figure the causes, and the effects will take care of themselves. We have four conditions—commodity prices; foreign trade; the railroad companies, transportation companies, carloadings and idle cars; and then retail sales—four divisions of marketing.

The third classification is labor. We study labor under three or four heads: First, wages; second, controversy; third, immigration. The fourth division we call business profits, meaning by that the earning records of corporations. Then there are business failures; of course, they are just the opposite of business profits. The commercial failures are merely a phase of business profits, so we have the corporate earnings and commercial failures.

Next, we have new security issues, because the volume of new securities being offered reflects more or less how conditions are as far as business profits are concerned.

Fifth, we have exchange transactions; in other words, those transactions which take place on the commodity exchanges, on the stock exchanges, and on the foreign exchanges.

The sixth division we call finance. Under finance we have bank clearings, bank statements, interest rates, gold movements between countries and operations of the United States Treasury Department.

Agricultural Production Extremely Important

The greatest thing in business today—the cause which has more effect than any other single cause upon fluctuation in business—is agricultural production. The thing that governs agricultural production will be the climatic conditions of the country, and who could pretend to foretell climatic conditions?

As far as the business cycle is concerned, you cannot tell from current agricultural production if we are in depression or prosperity. In other words, you find that the business cycle goes on regardless of agricultural production because the farmer is looking ahead and planning for his next crop, and at that time conditions may be entirely different. Industrial production, however, is at its last ebb in times of depression. We know it must be so because there is one thing that is making depression. In industrial production we have a peculiar

phase of it called new construction or new building. New building does not work out just the same as other industrial construction, because at the stages of prosperity, when prices are high, new building is postponed. When prices are going to be lower, six months or a year from now, at that time we will build, so one of the features of a period of depression, is, there is a tendency for new building to increase before other industrial production increases.

In the case of marketing we have first, prices. Now prices are low. That alone should be conducive to an increase in business. Now, what effect has price upon business? Do prices make business? Not always. Within the last year we had cotton at 42 cents, and we have seen cotton at 11 cents. Was it easier to sell cotton at 42 cents or 11 cents? At 42 cents. In other words, it is not the prices that determines whether you get the business or not. It is the trend of prices.

Foreign Trade, Labor, Immigration, Exchanges

Foreign trade is a big subject just now, of course; as a phase of marketing it has to be treated differently than in the case of the ordinary business cycle, because of the unusual conditions existing abroad. But in the periods of depression, ordinarily speaking, exports tend to increase and imports tend to decline. Why? Simply because when prices are low here there is a foreign demand. Why are exports not increasing now? It is on account of the monetary situation in Europe.

So far as labor is concerned, wages are low in a period of depression. It is relative. They are lower than they are when times are good, but there is this feature about it—the wages of labor tend to increase after the backward swing. Wages tend upward before labor conditions start to improve, which is a peculiar feature. There is a tendency to put wages down to bed rock, because expenses have been increasing during the preceding periods, and business has been falling off during the preceding period of liquidation. Wages get abnormally low. They get to the point where the worker cannot survive, and the employers have to increase the rates despite the fact that business does not justify it, and when they are doing that they are helping themselves, but they do not realize it. They say it is an added expenditure, and the profit is small. But with that increase to labor it does not need much to get business swinging back toward normal again, and that little increase which labor gets is one of the things which helps to bring it back.

As for immigration, it is no longer a factor in predetermining business conditions because of the new law in this country.

Then business profits: First earnings of corporations. Earnings are low. Where business is poor commercial failures are numerous. They are more numerous at this stage than they are in the stage of liquidation following a period of prosperity. In the stage of liquidation commercial failures increase, but they are large. They are small in number, but large in volume; large in dollars in the period of depression.

Next, exchanges. Here is the place I think you can profit very wisely if you are looking ahead on commodity exchange. Watch the prices on spring and winter wheat. Do not pay any attention to future prices. Watch the spot prices. The future price will say how conditions will be in six months from now. The future prices of all commodities are always fixed by the spot prices. Watch the basic price of such commodities as cotton, wheat, corn and pig iron. You get advance information there if you can get it any place, because the cleverest minds are looking ahead in the business world on the commodity exchanges. If the commodity exchange be low the prices will be low, but when they start to improve on the commodity exchange then you can expect improvement through the rest of the business structure. As far as the stock exchange is concerned, it provides a barometer of business only so far as the industrial stocks are concerned, the stocks of companies which handle raw materials particularly. I do not think that railroad stocks are a good barometer.

The average price of a selected list of industrials will give you a good barometer, and in times of depression especially good, because whenever there is an improvement in the stock exchange it will be decided by general business conditions as a general rule.

Now, as far as finance is concerned in a period of depression, first we have bank clearing. Let me tell you not to pay any attention to bank clearings so far as the future is concerned. In the first place, they are not a cause, for you know when you sell goods you bill them at thirty to ninety days. I do not know what the terms are in your line, but when bank clearings reflect the volume of business they reflect the volume of business that was, and not that is. The bank statements, however, are an excellent criterion. Every Friday morning the Federal Rererve Bank issues a statement of the condition of its combined Federal Reserve Banks. When business is poor bank statements are good.

With regard to the gold movements, I can eliminate international gold movements because they do not mean so much these days. There is a gold embargo although you may not know it, all over the world at the present time. Gold can not leave any country in the world at the present time, except the United States. Therefore, international movements of gold have not the same significance that they used to have. We gained about $500,000,000 or $600,000,000 in the last six months. Where did it come from? It is the new gold from Transvaal. There is a free market for gold in London at the present time, only on the new production of the Transvaal, so that the gold we have, has been sent us at the expense of not a single European nation for the past two years. I do not think there is any European nation, with the exception of Germany, that has not more gold than it ever had. France has over a million dollars in gold in the Bank of France. The Bank of England has ever $600,000,000, the largest stock it ever had. The gold we have gained has not been at the expense of foreign countries. It has been the new gold which has come into the world in the meantime.

Demand and Supply

Now we swing to the period recovery. As I told you, it is very difficult to say when depression ends and recovery begins. The cause of the business cycle can be expressed very simply. It is simply the maladjustment between supply and demand. I say a whole lot when I say maladjustment between supply and demand. In the period of prosperity production is overdone. In the period of depression production is underdone, and sooner or later the demand is going to get ahead of the supply. If for no other reason than that production is underdone, it is psychological that when profits are large production is increased; when profits are small or minus production is curtailed. At some point it develops that there is a shortage. There is a demand for this

commodity, and the supply is not sufficient. The increase in business helps one industry here and another industry there. As the result of that the improvement spreads all through the business world.

If you are going to produce a certain thing you have to take into consideration limitations. First, if you are a farmer you have to take into account climatic conditions. Second, if you are an industrial man, as all of you here are, you have to take into consideration other conditions, because if you are going to borrow the money at a profitable rate you have to take into consideration transportation conditions as they are going to exist.

You have to take into consideration other things, such as output and capacity. You have to predetermine what interest rates will be. You cannot do it accurately, but the success you are going to have will be determined by the extent to which you study your position, so as a result the demand and the supply will very rarely equal each other. It would be a miracle if they did. Therefore, we get a maladjustment between demand and supply. The great difficulty in your line, as in any other, is the fact that you center too much in your own line. You study your own condition. In industrial production you have to study conditions all through the business world.

The Orient As a Machine-Tool Market

By W. H. Rastall
Chief of Industrial Machinery Division
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IT IS a great pleasure indeed to have the opportunity to come and speak before you. Your invitation has implied an interest in foreign trade, and the activities of the Bureau of Foreign and Domestic commerce, as you know, are largely connected with foreign trade.

I have had the good fortune to know your Secretary for some years, and he has had some occasion to know of various trips I have made abroad. In a small way I have tried to co-operate with him in his business, and now, having been made one of the employees of the Bureau of Foreign and Domestic Commerce, it will be a great pleasure to help you in your business at any time the opportunity offers.

Those of your members with whom I have conversed have indicated that business conditions in your industry are most emphatically abnormal, and probably your minds have been concentrated very closely on your domestic problems. What I intend to say this morning is largely with the idea that you shall not concentrate your minds so closely on the domestic problem that you will forget opportunities in your foreign field.

If you have been watching the statistics closely, there will be very little that is new in what I have to say; but the conditions of your industry have been so abnormal that it has seemed possible that you would be interested in noticing not only the volume of your foreign business, but the most peculiar changes that are developing in the currents of that trade.

In the beginning, I want to take you way back to refresh your minds with regard to the conditions as they existed before we knew there was to be a war. The nature of your industry is such that war and munitions and machine tools are so closely allied that you gentlemen have borne the brunt of one of the largest manufacturing problems connected with the world war; and you felt this pressure, as you well know, long before the United States saw fit to declare war.

The statistics gathered by the American Government, covering the export of machine tools are not altogether satisfactory, because in their present form they do not allow us to segregate the different classes of equipment, and in speaking to a gathering of this sort, I cannot speak of lathes and the customs returns would not allow me to speak of milling machines, and I have thought it best to give you the figures based on the entire classification of metal-working machinery. That covers four items as usually presented in the customs figures, namely: Lathes, other machine tools, sharpening and grinding machinery, other metal-working machinery.

Pre-War Growth of Foreign Business

If you will take those four classifications or others that correspond to them and trace back to the year 1909, your total export business was $3,600,000 for the year.

I wonder if you realize the extent to which your foreign business was growing in the pre-war days: $3,600,000.00 in 1909; $6,000,000.00 in 1910; $9,600,000.00 in 1911; $12,100,000.00 in 1912; $16,000,000.00 in 1913.

I want to congratulate you on that showing. Those were the days of peace, the days when you were forced to face the competition of the whole world in the markets of the world. That increase was something like 440 per cent in five years.

From what has appeared in the newspapers, technical magazines and others, you see, you hear, you read a great deal about foreign competition—what the British can do, what the Germans can do, what the Japanese can do, or the Chinese.

Frankly, from what I have been able to see, this affair of foreign competition seems to be greatly overrated.

It has been my good fortune to spend nine years in selling machinery in Asia, and I have wandered over that continent quite a little, and if you will permit this personal statement, from all I could see, your products are so distinctive that really it is almost incorrect to say that you have foreign competition.

The fundamentals of the designs of your tools are based on the well-known American ways, which lead toward standardized production, special equipment, and in some instances single purpose tools, and it is not necessary for me to call to your attention the fact that European manufacturers and Asiatic manufacturers design from a radically different basis; and in so far as it is safe to make a general statement of this kind, their products are standardized tools in the sense that they are designed for general service. They are the tools that can be adapted to a great variety of purposes. But coming back again to these figures I read to you a minute ago, I want to give you the corresponding figures as representing the foreign trade of Great Britain during the same period.

You will remember that I gave you the figures that in 1909 you started with $3,600,000, and by 1913, this had expanded to $16,000,000.

The British exports in 1909 were $3,700,000; in 1910, $3,500,000—less than your own; in 1911, $3,700,000; in 1912, $4,500,000; in 1913, $4,900,000.

In other words, they had been able to increase their business about one-third during the same pre-war years that you had succeeded in expanding your business 440 per cent.

If you take the corresponding figures with regard to German exports, these statistics are a little confusing, because the returns of the German customs include under "machine tools" a great many articles that you would not so classify.

Those who know the German language better than I, tell me that to the German mind machine tools includes anything in the way of wood-working machinery, stone-cutting machinery, or that great variety of equipment that will be immediately clear to you when this distinction is made.

Using the German basis, their 1910 figures—I was not able to get the 1909 figures—their 1910 figures start in at $12,368,000; 1911, $12,323,000; 1912, $15,300,000; 1913, $19,500,000.

So that the increase during those same years was roughly, from $12,000,000, to $19,000,000.

Now, those of you who are familiar with the foreign trade of machine tools understand perfectly well that Germany as a factor in the world's trade in machine tools is not on a par with either Great Britain or the United States.

For that reason I hope that you will disregard the size of the business as indicated by these returns, and will consider only the ratio of increase.

Growth of Foreign Business Since 1913

The figures given stop at 1913. You well know that immediately after that, we had the war. German business was wiped out; British interests suffered; and your own trade was expanded enormously; but for your guidance it will be interesting to read these figures: (It is a very pleasing story and you will all enjoy it hugely.)

In 1914 you exported $14,000,000; in 1915, $28,000,000; in 1916, $61,000,000; in 1917, $85,000,000. (Mind you, this started from $3,600,000 in 1909.) 1917 was $85,000,000; 1918, $58,000,000; 1919, $58,000,000; 1920, $44,000,000.

Estimating for 1921 on the basis of the returns for the first eight months of the year, it looks like you would have exported, for 1921, $20,000,000 worth of tools.

That is a great come-down from 1917-1918, and you have all felt it; but have you realized the way in which it compares with 1909 with $3,600,000, and the other years?

The significant part of this whole statement is that your present export business is substantially on the level of 1915. It is far ahead of anything you knew in the years before that, and it represents at least 500 per cent of the business you did in, say 1909.

A very difficult situation arises when you try to analyze these returns, to study out the future prospects, to plan the way in which you should develop or maintain your export organization, in view of the tremendous changes that are taking place in your business; and yet it seems that this is the really important thing on which you would have your minds at this time.

In all the years to which we have referred so far, by far the heaviest of these shipments have been sent to Europe.

Returning again to these figures: 1910, 81 per cent of your shipments went to Europe; in 1913, 76 per cent; in 1915, 89 per cent; in 1918, 74 per cent.

I understand you have another speaker to dwell upon this European situation. I do not care to go into it too greatly in detail, but you will notice that there is a very marked shrinkage: In 1918, as I said, 74 per cent; in 1919, 69 per cent; in 1920, 57 per cent.

So although Europe as a customer for machine tools is the most important you have, and always has been, and although the changing conditions in Europe which will be described to you by another, have caused a tremendous shrinkage in not only the dollar value, but in the percentage, Europe is a market which must not be neglected.

The character of the tools that you ship there are your own specialties. They are of types that are scarcely produced in Europe, and they are certainly of the types in which you have a minimum of competition, if you have any real competition at all.

Foreign Markets Other Than European

There is a temptation for you to overlook the other machine-tool markets of the world. Probably your foreign sales managers divide the whole globe up into those territories which would be covered by a traveler, if he were sent abroad. Each organization would handle the problem a little differently from all other organizations, but it seems safe to say that if you send a traveler to Asia, he would cover the territory from Yokohama to Bombay. If you sent travelers to Europe, possibly Europe could be considered as a whole. Possibly you would send several travelers to cover that territory. If you sent travelers to Austrilia, probably they would cover Australia and also New Zealand. If you sent travelers to Africa, the whole continent would be more or less a single unit, but if you sent travelers to Latin America, I understand that Mexico and Central America would constitute one unit, the Carribean Islands and the Carribean countries a second group, and the main continent of South America would constitute a third group. As business stood before 1914, each of these three groups was very important, relatively speaking, and to a certain extent each group absorbed a quantity of machinery that would compare more or less with the total that would be absorbed by Asia, but there have been very great changes; Asia is developing in a way that few of us will recognize unless we have been giving the subject very close attention.

In 1910 all of the countries of Asia absorbed only $156,000 worth of your machine tools; in 1913 this had grown to $200,000; in 1915, to $500,000; in 1918, to $5,900,000; in 1919, to $8,800,000; in 1920, to $7,400,000.

In spite of all that you have seen in Europe, in spite of the tremendous expansion induced there by war conditions, the ratio of expansion in Asia has been more rapid, and in recent years and in recent months it has been more practically sustained. The indications are that for 1921 the exports of metal-working machinery to Asia will be about $6,000,000. In other words, 1921 so far as Asia is concerned will probably be a better market for your product than the year 1918.

Now, in comparison with these volumes, the present total of, we will say, $6,000,000, the Australian group in 1910 was $153,000, and in 1921 has expanded to $1,100,000, and the Latin-American group, comprising all three of those districts that we mentioned a few moments ago, increased from $476,000, in 1910 to $4,000,000, in 1920.

It seems that the significance of this tremendous development in the absorption of metal-working machinery in Asia is of great importance. Asia has absorbed

more machinery of the kind you produced in the last three years than she could have absorbed in a century had she gone on at the rate at which they imported such tools in pre-war days.

Asia is a continent that is densely populated, and from the days when your early voyagers first went to those countries, it has been the dream of the missionary, it has been the dream of the merchant, the politician—of every one interested—it has been their hope and ambition that Asia should be modernized; and some of our writers have come to refer to Asia as the "Unchanging East" and some times we gather the impression that here in this country we feel that the East is unchanging.

For this reason it seems necessary to emphasize to you that Asia is changing, and it will be a mistake if in developing your sales policies you feel that China is as she always has been, that India is unchanging, that because of the caste system and the thousand other obstacles, your trade will not develop.

Something connected with the war, I cannot tell you what it is, but something has agitated Asia. You all know the Japanese market very well. It is scarcely necessary to dwell upon it. For a great many years Japan has been absorbing very important quantities of machinery. We have all marvelled to a greater or less degree at the extent of their development, their rejuvenation, and the way they have absorbed Western practices, but it has been felt that Japan was a little different than the rest of the continent; and then again we looked long and earnestly at China. In some way China has found her way into the hearts of the American people, and I find among our business men a feeling that China deserves attention, while Japan perhaps does not.

It will interest you to know that during recent years, and speaking again in round numbers, Japan has absorbed roughly 50 per cent of the machinery that you have shipped to Asia.

China, on the other hand, in spite of her large area, in spite of her tremendous population and resources, has absorbed only about 15 per cent; but both of these markets of Japan and China are comparatively well known to the American manufacturer.

The markets of British India, the markets of the Dutch East Indies are not so well known to you. In order that we may understand this situation a little better, I have a few more figures here. It will interest you to know that of the metal-working machinery shipped abroad by the United States in recent years, in 1910 Asia absorbed only 3 per cent; in 1913 Asia absorbed only 1 per cent; in 1915 Asia absorbed 2 per cent; in 1918, when this mysterious influence connected with the war had been at work, this percentage was increased to 11 per cent; in 1919, 15 per cent; in 1920, 17 per cent.

And the indications are that for 1921 Asia will absorb 25 per cent of your exports.

Now, when you come to contrast conditions as they exist in Europe and conditions as they exist in Latin-America with conditions as they exist in Asia, you find some most startling differences.

Latin-America, comparatively speaking, is unpopulated; Asia is densely populated. The resources of Latin-America are possibly unexplored, but at any rate, so far as we know now, they seem to be limited. The mineral wealth of Asia is enormous.

Europe has her problems. You know well the nature of the resources of Europe, and the extent to which industrial development has been advanced, but I wish to emphasize that Asia is now developing very very rapidly in any industrial way, and probably the most significant of all the countries there is British India.

In the days before the war it seemed safe to say that British policy was to keep India as an agricultural country, a producer of raw materials, and if she had mineral wealth, to take that mineral wealth as raw material, carry it to Europe, manufacture it in the United Kingdom and let these two elements of the British Empire work for each other and produce a co-ordinated Empire.

Something has changed that policy, and now in British India you will find that the Government of India—all of those having political authority—the financial interests whether they be the native Indian interests or the British interests, and the financial interests of London, the man in the street of London, the man of the street in India, in fact everybody that is concerned with controlling the destinies of the Indian Empire—have decided on a policy that India shall be industrialized.

That statement should be brought home to you with all of the emphasis and significance that it is possible to put into it, because the subject is being approached in a perfectly scientific way, an effort is being made to establish the key industries here and there throughout the Indian Empire; the Government of India will turn to our employers and say, "You make railway cars"—"You make air brakes"—"You make enamel iron ware"—"You make aluminum utensils"—and so on through a long list of industries.

The natural resources of the country are being studied. They told me, while I was in India, that it was possible to produce pig iron there and lay it down in San Francisco at a competitive cost. They have developed a very large steel plant, largely under the guidance of American engineers, known as the Totta Steel Co., and the Totta Steel Co. has been demonsrated, they tell me, to be a great success. Imitating the Totta Steel Co., they have now started three other large enterprises, and it is planned to build in the neighborhood of the Totta Steel Co. and those other iron foundries, shops to produce machinery, shops to produce railway cars, railway equipment; India will roll her own rolls in the near future and will roll her own structural iron.

It is impossible to say how far and how rapidly this development can grow, but you may take it as a definite certainty that India is to be industrialized, in the largest sense of that word, as rapidly and as effectively as British and Indian interests can accomplish it.

Bearing these conditions in mind, I want to read you some figures regarding American exports of machinery to India, and by machinery I mean the metal-working machinery of the same classifications that we have discussed so far.

In 1910 your shipments there were $45,000; in 1913, $43,000; in 1915, $23,000; in 1918, $1,251,000; in 1919, $900,000; in 1920, $1,374,000.

This last figure represents roughly 18½ per cent of all the machinery that you exported to Asia.

As you remember, China takes about 15 per cent; Japan about 50 per cent.

Now, the question arises and is frequently asked me as to where the money comes from to promote these industries. India for decades has been known as the

"sinking hole" for capital. Any silver, any gold, shipped into India never comes out. It is the custom of the country for the people to hoard, and the hoardings in some instances are buried in large sums, and those of the common people, the man in the street, are frequently in the form of jewelry carried or worn by his wife or wives. Frequently they have plenty.

One of the native states of India—and by the native states, you understand I mean those territories in which the local government is not British—the state of Hydrobad, the largest of these states, is about the size of Indiana. It has a population of about thirteen million people. Its ruler, the Nyzam, is an absolute despot and in his despotism he is guaranteed by the British Government that this realm shall be for him and his line in perpetuity, and this guarantee is made by the British government as a reward for loyalty at the time of the Indian mutiny back in about 1856; but the Nyzam is of the old type we used to read about in our books. He has the power of life and death over all his subjects, theoretically. The British exercise a certain restraint. He has 300 wives. He has all of the things that are usually taken by an Asiatic potentate, and in a conversation with the director of the Nyzam's Mint, he told me that the Nyzam has a hoard of 500 tons of silver—and this was in the days during the war when exchange in India worried the authorities, and conditions became so acute that our own Government was approached for help, and we sent out, as you know, 300,000,000 silver dollars, and during all this time the British government was not able to secure or control one pound of the Nyzam's hoard.

I was considerably impressed with this discovery, and turning my way to another of the native states, Baroda, in conversation with one of the officials of the Baroda government, I mentioned the matter. This official, a native Indian, well trained, an Oxford graduate, smiled amiably: "Well," he said, "You should go to Kotch, the Rajah of Kotch has his cellars full of gold." I did not go to the Rajah of Kotch but I wanted to.

However, in Calcutta in the months between September, 1919, and January, 1920, there was a tremendous industrial boom, and it was possible to float a corporation for almost any enterprise that you can imagine, and the aggregate of these flotations ran into the tens or hundreds of millions in a very short time. They do things on a large scale in India.

The sugar industry is one of their particular problems. India makes more sugar cane, that is, India has a larger acreage devoted to cane than any other country in the world, and yet India is a very important importer of sugar, bringing most of her supplies from Java.

Now, you will easily understand that when the authorities controlling the destinies of India are studying the problem of industrializing the country, they would first of all wish to overcome a difficulty of that kind, and the sugar problem has been passed on to a committee for special investigation.

Cane is grown in every province in the country. It is grown in a very primitive way. The extraction methods are very unsatisfactory. As a business problem it is a very large, difficult and serious one, but they have made up their minds that they want to develop this industry on modern lines. They want to get modern machinery, and instead of importing this machinery they wish to manufacture it in their country, and the committee having this matter in hand definitely set about organizing a corporation with a capital of 50,000,000 rupees in order to manufacture this machinery. Now, 50,000,000 rupees is somewhere between sixteen and twenty-five million dollars, depending upon the exchange rate you use, and taking figures that have been in force during recent months.

Regardless of whether this corporation is a $16,000,000 corporation or a $25,000,000 corporation, it is certainly the sort of an enterprise in which you would have a very great interest.

In establishing this industry, they want to get in contact with sugar engineers in either Europe or America to guide the new enterprise, to make sure that their engineering methods will be correct, and that the enterprise once moving will be a genuine success.

Wherever you go in India you will find that the American expert has a very good reputation. Time after time large enterprises there have been put into the hands of Europeans, British or German or what-not, and in a great many instances, or several instances any way, these enterprises have failed, following which those in control have brought in American engineers, and I do not know of a single instance in which the American engineers have failed to make a thorough success in India, even though they are taking over properties where others had failed.

It will interest you therefore to do what you can to encourage American experts to go out to that part of the world. I say India, but the same principle applies to all of these Oriental countries.

American Engineering Methods Superior

There is a difference between American engineering methods and European engineering methods, a difference between American ideas in design and the European ideas. A European railway is nothing like an American railway. The fundamentals on which we work are altogether different. Traffic is heavy.

Now, in these Asiatic countries of large area and great population it is perfectly clear to you, I think, without much study, that their railway problems will at least approximate our own.

It is safe to say that the whole railway problem of England or France, probably also Germany, is less than the railway problem of our State of Illinois, and when you get European engineers in these countries that are destined to develop tremendously, it is obvious to you, I think, that the railways they lay down will be indequate in a reasonably short time.

To my mind it is very unfortunate that so many of the railways of China have been installed on European lines, and if you wish a concrete example, if you want to remove this from the discussion of what might be called the theory of things, and make it perfectly practical, you have only to examine conditions as they exist in India. For many years the factories in the neighborhood of Calcutta and elsewhere have struggled with their coal supplies and frequently have had to operate part time for no other reason. At the same time, at the pit-mouths in the mining regions there was plenty of coal, but the railways were inadequate. The fuel could not be transported. It is not merely a matter of locomotives and cars, but it goes into the very fundamentals of the whole design of the equipment.

The switching facilities are inadequate. The signalling facilities are not right.

You will make no mistake if when opportunity affords you will get American engineers, provided they are our best engineers, into these countries.

The problems that confront these pioneers are the greatest that are to be found anywhere so far as I know. They will tax the resources of our best men, and if you have the opportunity to send men abroad, by all means send the best that you can find, but if you will get these men abroad, the reaction will be entirely to your satisfaction, because they think in an American way. Their ideas of design are the ideas that you have developed as your industry has grown from year to year, and will correspond to the same development known in other branches of American engineering.

Now, as an index of the way in which India has been growing, I would like to read you a few more figures. Taking the average for the five years ending 1913 and 1914, that is to say, ending March 31, 1914, India imported $21,000,000 worth of machinery and metal work; that includes all classifications of machinery, locomotives and everything else. In the five-year period ending March 31, 1919, this importation was $20,000,000—in other words, substantially the same.

But during this period the United States increased its participation in a very marked way.

In 1913 the United States supplied about 3 per cent of this 20,000,000 rupees; in 1918 the American participation had advanced to roughly 25 per cent. Recent figures are not available to show whether that is being sustained or not, but if it is not being sustained it is purely a matter of salesmanship, and this raises the question as to what you should do in connection with your foreign trade.

How To Sell Machinery in Asia

One of the first questions that will be asked is, how to sell machinery in Asia, and fortunately it is very easy to give a definite answer.

One hundred per cent of the machinery sold in Asia is sold through the merchant there, the import merchant. That corresponds more or less closely to the export merchant as you know him here.

There might be some opportunity to discuss that, but there are no exceptions. The only way to sell machinery is through these merchants.

It is the duty of the Department of Commerce to try to assist you in developing your foreign business, and it will give us great pleasure to co-operate as fully and as heartily as we can.

Now, we have in Washington reasonably complete lists of all of the machinery dealers in every important city of the world. If you wish to get this information write to us or come and see us. It will be very much better if you can come to see us, because we would be disposed to turn over to you all of the information we have in our files regarding any and all of these merchants. If we attempt to handle the matter by mail, it seems that the best we can do is to send you a list, but if you can come to Washington we can probably tell you the name of every firm for which a given dealer is agent. We can give you an idea of his bent, that is to say, whether he specializes on mining machinery or textile machinery or machine-shop equipment. We can give you an idea as to whether his prejudices are such that he will refuse to handle American machinery, or, on the other hand, whether he is disposed to take an interest in your products. It is a very large subject.

I had the pleasure a few days ago of discussing this matter with one of your members. The conversation ran on for six hours, and this member of yours was kind enough to say he hoped we would meet again soon.

Frankly, the Department of Commerce can help you, and if you can take the time to come personally or to send a representative to Washington, we are at your service and you can decide for yourself just how much of this time you will devote to the subject.

Referring again to the matter of the business of India, we discovered in the papers a few days ago a very interesting item covering the amount of money floated in the London market for new capital issues, and it gave a certain value as representing investments being made in industries and so on in the United Kingdom, and another item as covering the investments in other parts of the British Empire, and another item covering the investments made in foreign countries; and in this connection it gave the figures for British investments in London for industries to be established in India and Ceylon for the six months ending June, 1920.

London invested one million and a half pounds sterling. For the six months ending December, 1920, this had expanded to three million five hundred thousand pounds sterling. For the six months ending June, 1921, it had expanded to fourteen million six hundred thousand pounds sterling. If you take a pound at $4.00, which is more or less correct, it represented floating $56,000,000 in securities on the London market, 5,000 miles away from British India, in a six-months' period.

It will not be necessary to enlarge upon this subject and call to your attention the present condition of the London money market and the fact that London has expanded from a million and a half to fourteen million and a half in a 12-months' period. This will give you some little index of the interest that British capital is taking in the industrialization of India.

Unfortunately it has been necessary to stress India in these remarks, but I hope you will not construe this to mean that you will neglect any of these other countries.

The Dutch East Indies are another colony representing another European country and I wish you knew a little more about the Dutch East Indies, because I know that Americans as a whole do not know this country well.

If you were to place the Western end of Sumatra on Seattle and draw maps to corresponding scale the Eastern end of the Archipelago would stretch a good long distance out into the Atlantic Ocean.

The Island of Java is substantially as long as the distance from Chicago to New York. It is not a very wide island. It is mountainous. It has about 30 volcanoes. Agriculturally it looks more or less like an impossible country, and yet it is populated by 39,000,000 people. It is cultivated very carefully. The principal industry there is probably sugar. On the Island of Java there are 200 sugar controls, having an average capacity of possible 500 tons of cane a day each. A plant of that kind would represent an investment of not less than a million dollars. So that the sugar industry in Java would represent an investment of very much over $200,000,000. A substantial amount of this is in the machinery used for crushing the cane and turning the juices into sugar.

In addition to this there is the rubber industry, the mining industry. The Dutch Eeast Indies are probably one of the greatest tin producers in the world.

Time prevents eniarging upon this subject, but you will find that the Dutch East Indies have absorbed also very large quantities of our machinery.

Starting in in 1910 with a negligible figure of $4,000.00 it expanded by 1920 to $326,000; 1919 was a little better $614,000 in machine tools.

There are quite a number of important Dutch merchant firms right here in the City of New York that are in a position to sell your goods in those territories, and they have on their staffs in Java and the other Isles of the Dutch East Indies a good corps of well-trained engineers, usually men with European training, and they have come to appreciate the qualities of the American tools and they like them.

Frankly, I believe that you would get better representation in those territories if it were possible to put your interests in the hands of Americans, because there is this difference between an American design and European design which has been mentioned, but if you cannot attain the ideal, if you cannot send your best man to Java, it is a very wise policy to do the next best thing, and I would suggest that you give very careful attention to these Dutch firms and see if you will not be able to establish relations with them that will result in business that will be very much to your advantage.

While in Batavia, going through one of the warehouses, maintained by one of these Dutch merchants, he was showing me his large stocks. He had a very fine stock, and he showed me a large number of American tools, and all of a sudden I said, "What is that?" —and this very nice Dutch merchant immediately apologized. He said, "I am very sorry; we are not going to do that again." And looking at it a little closer, I saw it was a Japanese copy of an American lathe.

This question of competition is one in which it is easy to say something as a general statement that can be contradicted in a particular instance and yet our limitations here are such that it seems to me necessary to confine ourselves to these general statements. Frankly, you have no Japanese competition. The difficulties of manufacturing lathes or other machine tools in Japan are tremendous. It is not easy to get the iron that is wanted. There is some question as to whether their cupola men understand well how to mix iron so that it will be suitable for various purposes.

Going through a Chinese shop in TIEN-TSIN, I saw a very nice looking milling machine, probably a perfect copy of the type that you know very well; and looking at it from a little distance it seemed to be a very nice tool, but close inspection revealed the fact that there had not been a single surface on that milling machine that had been ground or scraped.

Obviously there is no competition in that class of machinery, so that the problem in these different countries narrows itself down to that of selling a quality product at a comparatively high price.

If a Chinese manufacturer produces a milling machine using indifferent mixtures in the castings and declining to grind it on any of its surfaces, unquestionably he can produce it cheaply—and that is about the only thing that can be said in favor of it.

So that in organizing your sales campaigns abroad I would strongly emphasize that you take such measures as may be necessary to fortify your campaign with real salesmanship. Give your representatives there—whether they be Japanese or Americans or British or Dutch or whichever they might be—full information to show the superior qualities of your equipment, and this sales campaign should be supported with a reasonable amount of intelligent advertising, and by advertising I do not refer to newspaper or periodical advertising, but I mean almost anything that can be done to support your salesman, and probably the best results can be secured from a well-handled mailing list.

This is the sort of subject that could be continued indefinitely. I must not take too much of your time, but as I said before, if the Bureau of Foreign and Domestic Commerce can be of any assistance to you in handling any of these problems, we are very anxious to do what we can.

Conditions in Europe

BY J. H. DRURY

Treasurer, Union Twist Drill Co.

"YOU Americans are all right as manufacturers, but you are damned poor merchants." This is a statement, gentlemen, that was told and handed to me 25 years ago by one of the then leading German importers of machinery. The reason for making that statement was that at that time there was a tremendous development in Germany, and consequently a tremendous demand for American machine tools.

Of course, I repudiated that statement, but he said in explanation: "One of your manufacturers came over here. He made a certain tool. He wanted me to take the agency, and I asked him the price. He showed photographs and blueprints, and the price was perhaps satisfactory, but I said to this man: 'What is your capacity?' He told me. 'Well, now you can increase that capacity?' 'Yes.' 'All right. You go back to the hotel and figure on your utmost capacity, come back here and give me a price,' which he did. I contracted with him for his entire output. Of course, in time I did not want his output, but where the American manufacturer at that time showed he was not a good merchant, was that he was willing to give his entire production to one market, and that was foreign trade; he made no provision for his domestic market."

Well, gentlemen, many of you at that time made connections with foreign agents, and those connections have proved valuable, have proved loyal.

About a few years later than this time that I speak of, as you all know, or most of the gentlemen that are my age would know, as there are only a few here, there was a lull in the demand for American tools in Germany, and as the result of that lull many of the importers of American tools saw fit to encourage the manufacture of copies of American tools in Germany.

They were very good as copies, with the exception that they did not possess the quality, and except in a very few instances, the German tools are still good copies, but they lack the quality.

Now, that fact has become known throughout the continent of Europe; so that for many years, perhaps previous to the war, the Germans even with their lower priced tools found it difficult to successfully compete with the American tools; and since that time, and today, the conditions are different.

With the high prices of American tools and the low prices of German tools, I want to say to you gentlemen that they are simply flooding the continental markets of Europe; they have stopped the production of machinery in Norway and Sweden because of this. The Germans are getting into the markets of Italy, France, England, Belgium, and the new creation of states in Southeastern Europe. These loyal dealers that many of you gentlemen have, and you know them, are up against it. They

say: "We are confronted with this German competition; we appeal to our American clients or manufacturers. We have no assistance from them."

You have heard that the foreign dealers require financial assistance. You have read in the papers where some returning banker or some gentleman rushes into print with the statement that Americans must finance Europe. The United States must finance Europe.

I do not know perhaps just what that referred to; but I will give you the statement of some of the leading importers of tools in Europe: "They say we require no financial help. All we ask is to have the American manufacturer fix a price, based on, for instance, in francs, of so many francs to the dollar, and arrange for the payments on that basis, so that we will know where we are. We do not expect the American manufacturers to meet the German competition, but we do want a little leeway."

I have heard many of these agents, and I felt sorry for them. They said they could get no assistance, could not even get a decent reply; could not get any encouragement. Now then, the point I want to make is this: You gentlemen, most of you, have got a lot of foreign business. You have got agents, and it never cost you a dollar. These foreign agents came here and solicited your lines. Perhaps the machinery business is the one business for which it cost less to create this market in Europe than any other, for the reason that I spoke of a while ago, that the Germans first saw the possibilities of American tools and they were followed by the French and others who came here soliciting agencies and getting them.

Now then, what you must do is to make a study of foreign conditions. We all make a great deal of studies of new designs, new fixtures, and new methods. We have scientific treatments of various projects; but how far do you go into the detail statistics that you alone can get in connection with this foreign trade? Do you study it? I wonder if you do. I wonder if you simply take the reports that come in to you, that the German mark is at such a price, and it is useless to attempt to compete, also the franc is so low we can not do anything with that.

If you are not going to do something, you are going to jeopardize your foreign trade. If you let it go; it is going to cost you some real money to get it back when you are looking for it. What I hope is this, and I hope you will do it, and that is to take this matter up seriously with your foreign representatives, and show a disposition to work with them; show that it is simply a partnership affair, that you are willing to help them; that you are willing to spend some money to help them. It won't take an awful lot, because this condition will not continue very much longer.

Three weeks ago I was in Frankfort, Germany, and some of my friends told me of a strike that was going to occur on the following Tuesday. I was there on Saturday. The strike was not among the workmen, it was among the clerks, the draftsmen, or the engineers as they called them, and it was for an increase in pay. Twenty-five manufacturers were bound together in the association. They considered this question of more pay. Three voted in favor of it. One of them told me: "It is a shame. We have got to pay these men more money. The cost of living in Germany is increasing every day; consequently, we must pay some attention to it."

I have not yet heard the result of this strike, but I saw in Italy, three days before, discount sheets sent out by German manufacturers in connection with tools, in which the discounts were changed. They were raised 800 per cent.

Now, that does not mean very much. For instance, when you see a chuck made by a manufacturing company of Connecticut which sells in Italy for $28—when you see a copy of it which looks just like it, made in Germany, and sold for $3.70, you wonder how they can do it, or if they stole the material, and somebody threw in the labor.

But this has got to change. So do not get worried about those things, because their costs will go up and continue to go up; but I will say once more, that I hope you will give this serious attention and take this matter up at once.

Those of you who have loyal foreign agents, show them that you are loyal to them; show them that you are trying to help them over this period, and perhaps it will be over by three or four years; and if you do this now, your business, four or five years hence will be in a splendid condition.

And, just remember at this time, if you had a fair foreign trade today, the conditions in every one of your shops would be much better than they are.

Now, then, a man will tell me we do not want labor to go back where it was in 1914. Gentlemen, it does not make any difference if you pay a man 25c. an hour or 50c. an hour if he can buy just as much for the 25c. as he can for the 50c., but it does make a lot of difference in your sales.

Now, then, you have got to take the bull by the horns, and you have got to get your costs down. You have got to get your selling prices down.

Formula for Strength of Rope

How strong is a rope? At the Bureau of Standards laboratories in the Department of Commerce, tests have been made that have resulted in answering that question with a formula.

For three-strand regular lay manila rope from ½ to 4½ in. in diameter, the following computation will give the breaking load of the rope:

The average breaking load in pounds equals 5,000 multiplied by the diameter of the rope in inches, multiplied by the diameter of the rope increased by one.

This will give, of course, the average maximum weight that the rope will hold, but the working load or the load that a contractor or safe-hauler may apply with proper safety and precaution would be considerably less than the load given by the formula.

EDITORIALS

Progress of the National Machine Tool Builders' Association

IN ANOTHER part of the paper will be found abstracts from several of the addresses made before the recent annual meeting of the National Machine Tool Builders' Association. They are worth reading even if you are not connected with the machine-tool building industry, for the problems of the makers of machine tools are much the same as those of the users.

As was to be expected, this year's meeting was more concerned with the present industrial depression than with more technical matters, for the fact cannot be ignored that the industry as a whole has been struggling through the worst period of its existence. President Tuechter's admirable report brings out this point very clearly. The one redeeming feature of the situation is the interest of the members in the valuable statistical work just started by the general manager of the association. Had the figures on total production been available over a period of years it is most unlikely that many of the serious economic mistakes, by reason of which the industry is now suffering, would ever have been made.

In the past, as pointed out in several of the addresses, this association has been very successful in cultivating good-fellowship and mutual confidence among the members, a praiseworthy activity but one which has had but little effect outside the industry. In the future, however, if the promise of the sound economic and statistical program laid out by the officers is fulfilled, the benefits will accrue not only to the owners of machine tool plants but to their men and to the country as a whole.

A business run on unsound lines is a menace to the whole commercial structure for its mistakes involve others and its losses are seldom confined to its owners. The economically sound organization, on the other hand, is not only successful itself but contributes to the success of those who have dealings with it.

Can We Afford Not to Disarm?

MANY people are skeptical as to what a disarmament conference can accomplish; some are in doubt as to the need for disarmament. Every taxpayer is painfully aware of the cost of past and future wars, but has come to look upon this expense item as an inescapable insurance premium for protection against aggression.

Thoughtful men, however, are watching the steeply ascending curve of armament costs all over the world and are wondering where it is to stop. If it keeps on rising at the present rate much longer, there will be no money left for peaceful needs—then what?

As we see it there must be a sharp limitation of this race in the immediate future. The world cannot afford to continue the contest and it is consequently well that the representatives of the more powerful nations gather together next week in Washington to see what can be done about it.

If concrete reasons for the gathering of such a conference are wanted, one has only to glance through the following London dispatch to the daily press:

Tonight the chancellories of the continent are gravely perturbed at the attempted Hapsburg restoration and the first symptoms of war fever are apparent.

Tonight Lord Curzon's department got word that Karl has arrived at Budapest.

It is commonly believed that England is on the verge of resumption of war with Ireland. Germany is plunged into a great political crisis because of the resignation of the Wirth Cabinet.

In France, Communism is raising its head. In Portugal, Cabinet members have been assassinated by reactionaries. Bulgarian War Minister Dimitroff was shot dead yesterday.

In Spain, the throne of King Alfonso is tottering, while his army attempts to retrieve the Moroccan disaster.

Italy may well be convulsed as a result of the subterranean support alleged to have been given by her Foreign Minister to the return of Emperor Karl to Budapest.

Reports credit Jugo-Slavia, Czecho-Slovakia and Rumania with making preparations to expel Karl.

The war alarms extend even beyond Europe. Tonight London learned that an ugly situation has arisen in the Far East, due to China sending a note to Japan which is tantamount to an ultimatum regarding Shantung. The terms of China's last reply to Japan include:

"The Japanese claims which it is desired to negotiate are highly objectionable and never have been recognized. It is only proper that the entire Japanese army should now be immediately evacuated."

Certainly not a very pleasant picture from any point of view. But leaving out for a moment the moral and humanitarian aspects of the problem, bear in mind that most of the countries involved are deeply in our debt and that some of them are practically bankrupt. Our security is none too good as it is, but it will be worse than worthless if more fighting is to take place.

Can we afford to let this go on any longer? Can we afford not to disarm and to see to it that everyone else does likewise?

Two National Ailments Which Seem About to Be Mended

THE first two recommendations of the President's Unemployment Conference looking toward a permanent cure for the unemployment evil, have to do with the reduction of railroad rates and with the speeding up of the deliberations on the tax bill. The news of the day indicates that the recommendations along these lines are being followed, for we heard a few days ago that rates on hay and grain had been reduced and that other reductions were to follow.

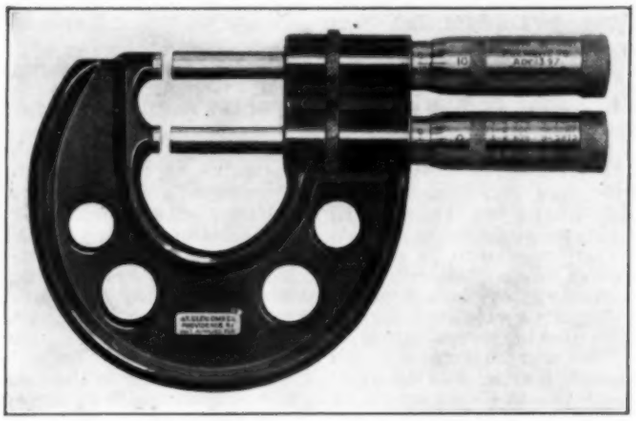
On top of this comes the move of the republican Senators to force continuous sessions of the Senate until the tax bill is passed. As we have remarked before, the tax bill leaves much to be desired as a model revenue act but under present conditions a poor act is better than none.

The Unemployment Conference had no power to enforce its recommendations, but it must be a source of satisfaction to the members that two of their suggestions are receiving such immediate attention from the constituted authority in both the administrative and legislative branches.

Shop Equipment News

Slocomb Snap-Gage Micrometer

The illustration shows a measuring instrument that has recently been brought out by the J. T. Slocomb Co., Providence, R. I. This tool is in reality a micrometer with two measuring screws, each of which can be locked



SLOCOMB SNAP-GAGE MICROMETER

in any desired position, giving the instrument a wide range of measurement and adaptability. The tool is at present made in only one size, having a measuring range of one inch. In this way a single instrument can take the place of many snap gages in places where it may not be desirable to tie up capital in a large number of snap gages which are not in constant use.

When used as a snap gage, the screws are set to the desired high and low limits respectively. This setting can be done either by reading the micrometer screws themelves, by standard measuring blocks, or by samples which are known to be right. In this way a single instrument may be used for a large variety of sizes within the range.

When used in the machining of work, it may be advantageous to set and lock the lower or "no-go" screw only. The upper screw is set at or above the high limit, and can readily be used as a micrometer to ascertain how much stock is to be removed. Used in this way, the micrometer takes the place of a special fixed gage with an indicator on the high limit, as is sometimes used.

The micrometer is particularly useful for inspection work. The lower screw may be locked at the rejection point for minimum diameter, and the upper screw used to measure the large diameter, when it is advisable. It is especially applicable to inspecting wire, rods and sheets. The frame is of forged steel. The same accuracy is maintained as in the other micrometers made by the firm.

Cleveland "Mezzo-Steel" Twist Drills

The Cleveland Twist Drill Co., Cleveland, Ohio, announces a line of twist drills made from a special steel and said to possess some very unusual qualities, particularly regarding life in service. The steel has the qualities ascribed only as the result of a special heat-treatment. The steel properly heat-treated is said to make it possible to obtain a performance much better than that of carbon steel, in fact, midway between carbon and high-speed steel, and to effect a very marked economy in drilling costs. The trade name for tools made from this steel is "Mezzo," meaning midway between carbon and high-speed steel.

Tests of performance as compared to carbon drills are shown in the accompanying table, compiled from tests run on the maker's own product. These results are particularly interesting in view of the fact that the full efficiency of high-speed steel tools is obtained only in machinery of great rigidity and power, which is at the same time capable of high speeds. As many shops are not equipped with machinery of this character, they consequently use high-speed drills under disadvantageous conditions. Moreover, they break many high-speed drills, because the drill press is lacking in rigidity. Such conditions and the comparative drilling costs often force shops to abandon high-speed in favor of carbon steel tools.

It is evident that a saving in drilling expense can be made, in such cases, as well as maximum production obtained, by the use of a drill which can be purchased at a moderate price and which will run at speeds and feeds considerably above those possible with carbon drills, and still stand up to the work. Mezzo drills are said to fulfill these requirements, and to have proved to be efficient and economical tools when working under the conditions for which they are intended. They are particularly well adapted for drilling cast iron at greater speeds and feeds than can be used for carbon drills. In

TEST OF MEZZO AND CARBON DRILLS

Size Drill, In.	Material Drilled	R.P.M.	Feed per Rev., In.	Speed, Ft. per Min.	In. Drilled—Mezzo	In. Drilled—Carbon
¼	3-in. C.I.	356	0.032	60	60 *	5
¼	4-in. M.S.	356	0.024	60	32 *	½
¼	4-in. M.S.	294	0.024	58	10½	¼
¼	4-in. M.S.	225	0.020	50	32½	¾
¼	3-in. C.I.	294	0.020	58	30 *	1
⅜	4-in. M.S.	225	0.024	55	8	⅛
⅜	4-in. M.S.	225	0.017	55	7	2
⅜	3-in. C.I.	294	0.032	75	30 *	2½
½	4-in. M.S.	225	0.015	60	21	1½
½	3-in. C.I.	225	0.020	60	25	1
½	4-in. M.S.	180	0.016	59	24	4
½	4-in. M.S.	144	0.020	51	12	1½
½	4-in. M.S.	144	0.032	61	30 *	2½
2	4-in. M.S.	106	0.015	55	32 *	3¼

NOTE—3-in. C.I. means a cast-iron billet 3 in. thick.
4-in. M.S. means a machinery-steel billet 4 in. thick.
* Means test stopped with drill still in good condition.

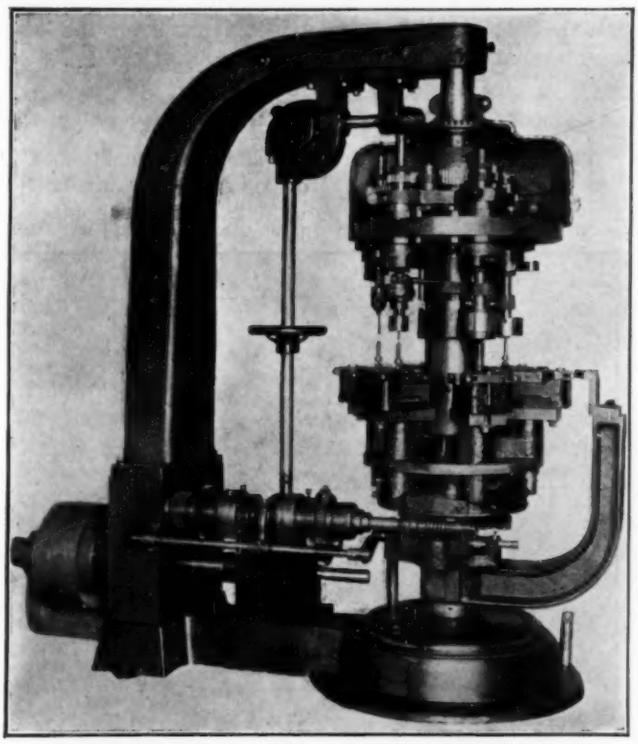
machine steels and the softer alloy steels, these drills perform at much higher rates of speed and feed than carbon-steel tools. They are not however, suitable for extremely hard materials.

An inherent advantage of the Mezzo drill is said to be its greater ability than carbon steel to withstand softening under heat. Heating the cutting edge of a Mezzo drill to even a dark blue color does not draw its temper, but the tool is said to work at its best efficiency at this temperature. As shown by the table, these drills should be used at approximately double the feeds and speeds at which carbon drills under average conditions work satisfactorily. The drills have a special blue-black, rust-resisting finish. At present they cannot be furnished smaller than ¼ or larger than 2 inches.

"Jackson" Vertical Automatic Chucking Machine

In the accompanying illustration is shown a type of the "Jackson" vertical, automatic chucking machine recently placed on the market by the Vertomatic Manufacturing Co., Third & Buttonwood Sts., Reading, Pa. The machine is intended for the rapid and automatic performing of machining operations on small parts such as required for plumbing, electrical and gas fittings, and for automobile work. Drilling, reaming, tapping, milling, facing and similar operations can be performed on the same piece, it being necessary for the operator only to feed the machine. The machine is heavily but compactly made, so that a high production can be obtained with a small amount of floor space. It is ordinarily driven by belt. The illustration shows one-half of the cover which guards the gears removed.

The machine is made in three types. The Type A machine is intended chiefly for work requiring a series of operations on the same piece, these operations being



"JACKSON" AUTOMATIC CHUCKING MACHINE

from three to five in number and performed at either the same or at different points on the work. On work requiring only two operations, two chucks can be fed at each indexing. In this machine there are six work-holding chucks, and five active spindles above them. Each spindle carries a particular type of tool adapted to the work that it performs.

At the front station the operator places a piece of work in the fixture which is at that point. The fixture then revolves about the vertical axis of the machine, and the work is automatically clamped in place. Under the first spindle, the first machining operation is performed, and then the work fixture indexes another portion of a revolution and a second machining operation is performed. By the time the piece has made one complete revolution, it has received the entire number of operations and is automatically ejected. Since all of the chucks hold work, and each spindle operates at each indexing of the table, one finished piece is ejected with each indexing.

The speed of the spindles can be varied by means of the gearing. The spindles do not feed to the work, but feeding cams located under the chucks cause the chucks to move upward independently of each other at the desired speed and to the required height for the operation being done. When the operation is completed, the cams allow the chucks to drop down, and the chuck turret is then indexed to the next working position and locked while the operation is being performed.

The Type B machine is intended for work requiring two or three operations. It has four double chucks and three pairs of spindles, so that the operator places two pieces into each chuck every time it indexes. The work in three chucks is machined during the time the operator is replacing the work in the idle chuck at the loading station, and two finished pieces are ejected at each indexing of the turret.

The Type C machine is for jobs requiring a single operation only, or two operations combined in one tool, such as facing and tapping. The machine has no clutch nor indexing mechanism, and each spindle is mated to a certain chuck and operates on this chuck only. The chuck turret and the spindle turret are locked in position and rotate constantly in one direction at the desired speed. The work is placed in the chuck at the loading station, and as soon as it passes on, a single continuous cam raises the chuck toward the tool, and the machining operation is performed while the turret is rotating. Thus, in five of the six chucks the work is being performed at the same time.

The vital parts of the machine are made of hardened and ground tool steel. Change gears are furnished to permit of a range of speeds and feeds. The working parts are guarded.

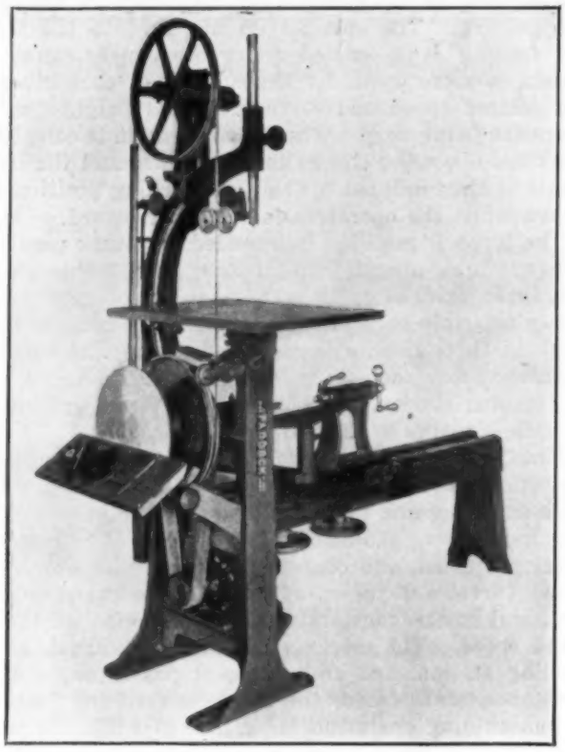
Paddock Three-Way-Table Band Sawing Machine

The Paddock Tool Co., 320 Ridge Bldg., Kansas City, Mo., has placed on the market a band sawing machine for wood-working use, the principal features of the machine being the facts that the table can be tilted in any one of three directions, and that a three-wheel ball bearing guide is employed for the saw. The frame of the machine is a T-section casting, providing means for locating the motor at its base. The table can be tilted 45 deg. to the front, 45 deg. to the right side or 35 deg. to the left side, being locked in any desired position by means of a double-jaw clamp. It is placed 45 in. above the floor. It is said that the 20-in. saw will take a cut under the saw guide 16½ in. deep. In this machine, the speed of the bandwheels is 600 r.p.m., although the motor speed employed is 1,800. The band wheels run on double-row ball bearings, large oil pools being provided for lubrication.

A G.E., a.c. motor is mounted on the base of the frame, and belted to the pulley on the lower wheelshaft. Tightening of the belt is effected by removing shims from under the base of the motor. The bandwheels are provided with rubber tires.

The machine can be furnished with a number of attachments, such as shown in the accompanying illustration. On the front of the frame is placed a 15-in. sanding disk having a tilting table. On the back of the frame is an 18-in. wood-turning lathe having cone

pulleys, so as to give speeds of 300, 600 and 1,200 r.p.m. to the spindle. A wooden lathe frame carrying a tail-stock is provided. A 35 x 6-in. sanding roll can be

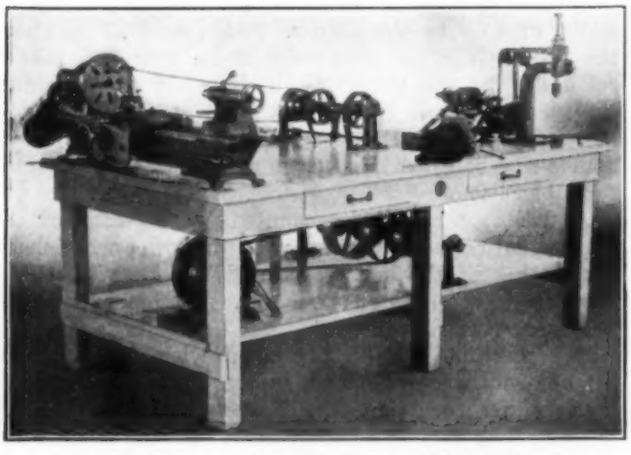


PADDOCK TILTING-TABLE BANDSAW

placed in the lathe, so as to make it adaptable for surface sanding. If desired, an abrasive wheel can be mounted on one of the shafts, so as to provide a grinder. The machine is thus applicable to a wide range of woodworking operations. It is made in four sizes, the band-wheels being 20, 25, 30 and 36 in. in diameter, respectively.

Myers No. 2 Combination Work Bench

The Myers Machine Tool Corporation, Columbia, Pa., has recently placed on the market the combination work bench shown in the accompanying illustration. The outfit is intended for use in such places as automobile repair shops and hotels, and for mechanics who have need for a small installation. It is especially adapted to the use of those requiring a small lathe and hack-saw, being a larger unit than the one described on page 34 of the *American Machinist*.



MYERS NO. 2 COMBINATION WORK BENCH

The machines are mounted on a table 45 in. wide x 84 in. long x 32 in. high. Two drawers are provided for holding small tools. On the shelf of the table is mounted a motor that drives all of the apparatus through the countershaft, also placed on the shelf. Either a.c. or d.c. current of 110 or 220 volts can be used, the motor operating at 1,750 r.p.m. and giving ½ hp. The lathe has a swing of 10 in. and a working length of 45 in. It is provided with change gears, power cross feed, compound rest, back gear and three-step cone pulley.

A 10-in. sensitive bench drill, having a small table and a ⅜-in. chuck, is mounted at the other end of the table. A 10-in. grinder head carrying an abrasive wheel and a muslin polishing wheel is also provided. A 3½-in. machinist's vise having hardened steel jaws, is mounted at the front of the bench. All of the machines are made by the concern. The lathe is driven by means of an open belt from the countershaft above the table, but the other machines are driven direct from the lower countershaft.

Holt T-35 Caterpillar Tractor

The Holt Manufacturing Co., Inc., Stockton, Cal., has recently brought out the small caterpillar tractor shown in the accompanying illustration. The machine

HOLT T-35 CATERPILLAR TRACTOR

is known as the Model T-35, and is intended for general use, both on the farm and in industry. It is said to be easily and economically operated, and to be similar in general details to the type of tractor previously made by the concern.

The tractor consists of three main units, the motor, the transmission, and the trucks and tracks, each unit being entirely self-contained. A four-cylinder motor is used, the bore being 4-in. and the stroke 5½-in. It runs at a speed of 1,000 r.p.m., and develops 28 hp.

A chrome-vanadium steel crank-shaft 2¼ in. in diameter is employed, and large bearing are provided. The valves are placed in the heads of the cylinders, and an overhead camshaft is employed. The governor is mounted directly in the camshaft driving gear. The motor is lubricated by pressure, an oil pump being provided. A tubular, finned radiator is employed.

A multiple-disk dry-plate clutch is used and a clutch brake is provided. The transmission provides three speeds forward and one reverse, all gears being made of heat-treated chrome-nickel steel. The mainshaft of the transmission is equipped with heavy-duty Hyatt roller bearings at the rear and with double-row New Departure ball bearings at the front. Side clutches are provided, so that either one of the trucks can be disengaged from the motor. In this way, the machine can be turned, a brake being placed on the housing of each side clutch, so that quick turning can be performed. The mechanism of the final drive is entirely enclosed, so as to prevent dirt from getting into the gears, which run in oil.

The truck frames are made of heavy pressed steel. The wheels are made of cast iron, with chilled rims, and run on heavy-duty Hyatt roller bearings. The front idler is made of steel and is carried on two roller bearings. The track is 10 in. wide, the link and the shoe being made in one piece of carbon steel. The lubrication of the truck wheels and idlers is accomplished by means of Alemite grease plugs. A spring-cushioned seat is provided for the operator, the controls being conveniently arranged. A power pulley 10 in. in diameter and having a 6½-in. face is provided for driving a belt. The machine is 103 in. in length overall, 48 in. wide, and 52 in. in height to the top of the hood.

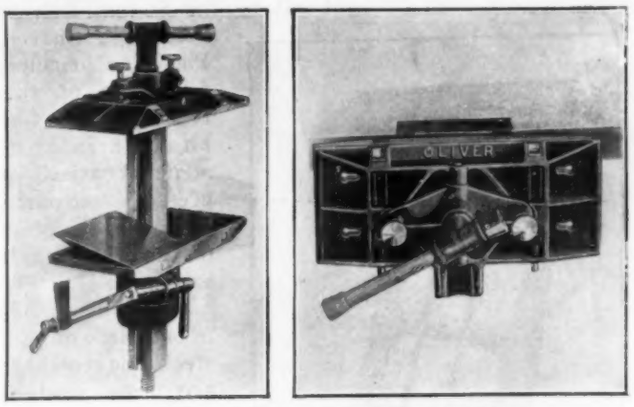
Oliver Universal Woodworkers' Vise

The Oliver Machinery Co., Grand Rapids, Mich., has recently placed on the market its No. 1 universal vise for the use of patternmakers and woodworkers. The device is capable of operation in many different positions, and is adaptable to a wide range of work. On the right of the accompanying illustration it is shown in its natural position, for clamping work in the usual way. However, two small dogs in the top of each jaw can be raised, if desired, so as to form stops for the holding of circular or irregular-shaped work that does not fit down into the vise proper.

Besides holding parallel-sided pieces, the jaws can be set by means of thumbscrews so as to clamp at an angle, this being particularly desirable with wedge-shaped work. The jaws can be turned about the axis of the screw, and used to hold work in any position desired, whether at right-angles or at only a slight angle to the natural position. When swung through one right-angle, the vise is well adapted for holding work above the bench level. When swung through one-half turn, the small steel-faced jaws on the side of the main jaws come into position for the holding of metal parts. This is particularly useful for working on metal patterns.

In addition to the vertical plane, the jaws can also be placed in a horizontal plane, as shown by the view on the left of the illustration. If desired, the jaws can be set to clamp work at an angle, in the manner stated before. In addition, the small detachable angle jaw shown lying on the lower jaw is for use in holding small, irregular-shaped pieces.

The jaws are 18 in. long by 7¼ in. wide, and the vise has an opening of 16 in. It is stated that the entire construction is very rigid, and that great holding power is provided no matter at what angle or in what position



OLIVER NO. 1 UNIVERSAL VISE

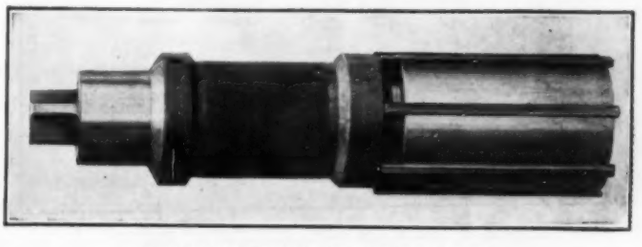
the vise be placed. The screw used is 1¼ in. in diameter and has a buttress thread. The vise weighs, when boxed, 85 lb., the contents of the box being 2 cubic feet.

Ransome Parallel Expansion Reamer

The accompanying illustration shows a reamer for the refinishing of the bores of automotive engine cylinders, and recently placed on the market by H. A. Hopkins & Co., Inc., 247 LaPorte Ave., South Bend, Ind. The reamer can be used without removing the cylinder blocks from the chassis, and is ordinarily driven by hand. A ratchet wrench can be furnished to fit on the shank of the reamer, so that the device can be turned even where there is only scant clearance. In order that the tool can be counterbalanced, so that the proper feed can be given to it, a hook and a swivel are fastened to the wrench, enabling the connection of a rope so arranged as to hold a counterweight.

The reamer consists of three units, the body, the nut and the blades. The blades are secured in the body by means of flanges running in T-shaped slots. A very long nut is employed. A micrometer dial is provided, so that it is possible to set the blades with an accuracy of 0.001 in. The blade ends are fitted into the nut and rest solidly against the nut and the body, so that they have a firm bearing and give a uniform expansion when the nut is turned.

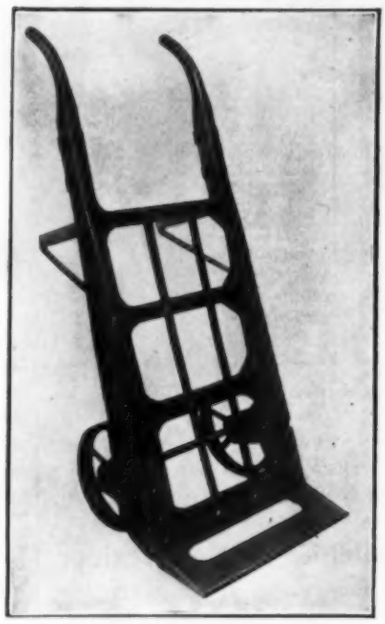
Ordinarily, the lower ends of the blades are ground without clearance slightly smaller than the cutting edges, so that they serve as a pilot to assist in the entering of the reamer. After the pilot ends have been placed in the bore, the reamer can be adjusted for size. The cutting is done by means of the sharp corner at the lower end of the cutting edge, so that the metal is removed by a boring rather than by a scraping action. The reamer is made in five sizes, the total range of adjustment being from 2¾ to 4 in.



RANSOME EXPANSION REAMER

Sharon "Bluenose" Hand Truck

The illustration shows a type of heavy-duty hand truck for general warehouse and industrial use that has recently been brought out by the Sharon Pressed Steel Co., Sharon, Pa. The principal feature of this truck is the fact that it is constructed entirely of pressed-steel parts, with the exception of the wheels, axle and handles. The main frame is made in one piece of ¼-in. steel. The crossbars are made straight for general use, but can be depressed for the carrying of barrels. The wheel lugs are a part of the frame and have a ½-in. bead on each side. This construction prevents the tendency of the wheel lugs to buckle when the truck is heavily loaded. The nose of the truck, which gives it the trade name of "Bluenose," is a steel stamping made from one piece of ¼-in. steel, and well reinforced by the large flanges on the corners.

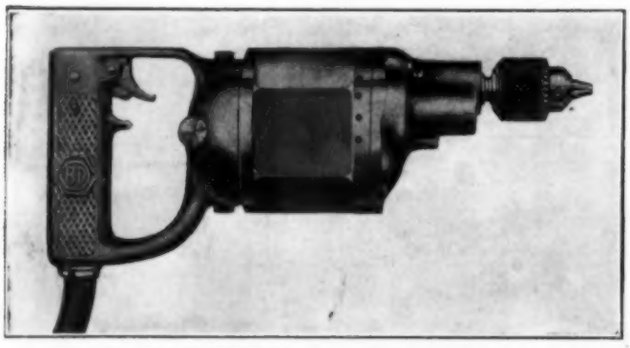


SHARON "BLUENOSE" HAND TRUCK

The footing is composed of steel stampings. The handles are ordinarily of bent oak, but can be furnished straight if desired. The trucks are equipped with malleable-iron wheels, and either plain or roller bearings can be furnished. The truck is made in two sizes, the lengths overall being, respectively, 54 and 64½ in.; the heights, 10½ and 13 in.; the widths at the nose, 18½ and 23½ in.; the wheel diameters, 9 and 12 in.; and the weights, 65 and 120 pounds.

Black & Decker Light ¼-Inch Portable Electric Drill

The Black & Decker Manufacturing Co., Baltimore, Md., announces a light-weight portable electric drill, shown in the illustration, for drilling metal or wood, the capacity in steel being ¼ in. The drill has an aluminum-alloy housing, and weighs only 5 lb. It has double reduction gearing, giving a no-load speed of 1,600 r.p.m. It is similar in all respects to the other drills made by the concern, having stub-tooth gears of heat-treated chrome-nickel steel, running in a grease-tight gear box. All bearings are removable and renewable. The drill is equipped with a pistol grip and trigger switch, with the switch mechanism in the handle. It is adapted to close-corner work, the drill spindle being arranged so that it is possible to drill within about an inch of any obstruction.

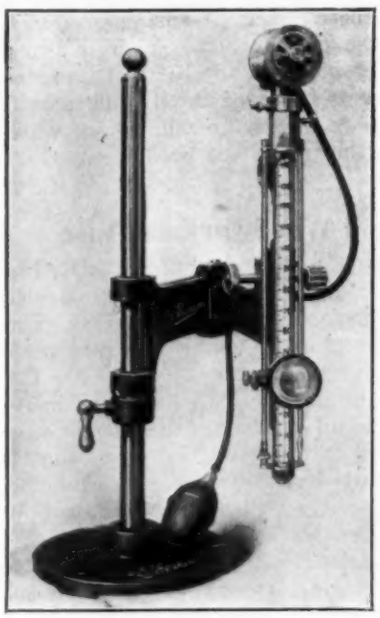


BLACK & DECKER ¼-IN. ELECTRIC DRILL

The parts are easily accessible. The brushes can be renewed from the outside of the case. By removing four screws, the commutator, switch mechanism, field leads and cord terminals may be entirely exposed. The commutator end bearing is carried in a spider integral with the motor case, holding the armature in alignment and permitting the removal of the cover plate while the tool is running. The rubber-covered cable is clamped in the handle, so that strains on the cable have no tendency to pull the terminals loose from the switch. The tool is supplied complete with a three-jaw chuck, flexible cord and attachment plug.

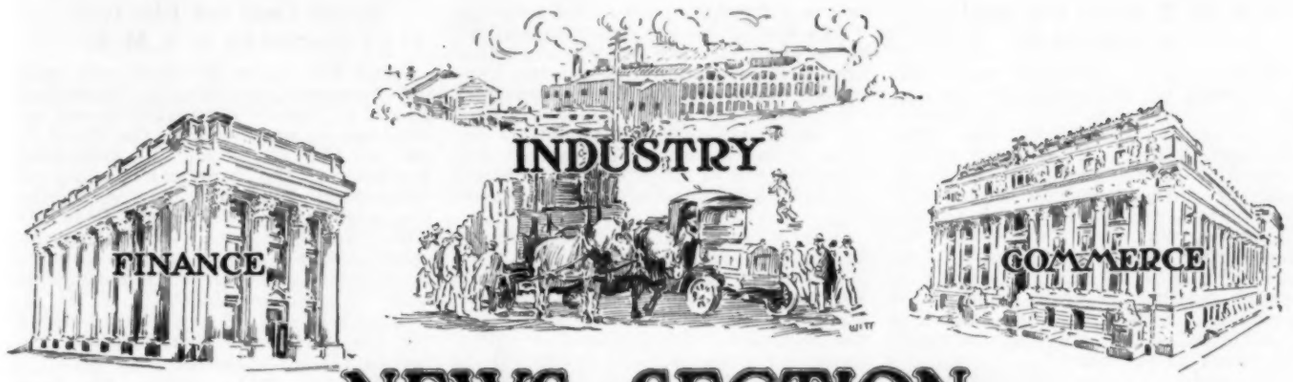
Changes in Shore Model-C Scleroscope

The Shore Instrument and Manufacturing Co., Jamaica, N. Y., has recently made some changes in the design of its Model-C scleroscope, the new model, designated as Model-C1, being shown in the accompanying illustration. The maker claims that the refinements made so increase the flexibility of the operating mechanism that the instrument will give more uniform service, even though the adjustments are comparatively approximate, and the working conditions, including the skill of the operator, less favorable. Among the features to which attention is called are the fine screen covering the openings in the housing above the scale, to prevent dust from entering the operating mechanism; and the replacing of the leather operating piston by one made of tungsten steel. The former rigid adjustment of the hammer-hook mechanism has been replaced by a flexible adjustment, which should greatly prolong the life of the glass tube; and the hammer-hooks have been provided with shock shoulders, which prevent breakage or disalignment of these parts. In addition, more perfect glass tubing is being employed.



SHORE MODEL-C1 SCLEROSCOPE

The refinements are said to so perfect the instrument that it may be easily and accurately operated, under all conditions and speeds. It is adaptable to the use of the laboratory man, as well as to be the precision manufacturer on quantity production.



NEWS SECTION

Engineers to Become Men of Affairs, Says Dean Cooley

During his first visit to the headquarters of the Federated American Engineering Societies since his election to the presidency of the organization, Dean Cooley announced his conclusion that the most necessary thing to do first is to tune up the existing machine so that it may be in the best working order to accomplish the multiplicity of tasks that are before it. Engineers are foremost, he said, in the actual service rendered to the public, but the amount of public service they are capable of rendering can be increased immensely if the Federation can co-ordinate and direct the vast energies of the nation's engineers. The public already has been sold the idea of the federation. Dean Cooley believes, but he thinks much education and hard work will be required before the federation can be sold to the engineers themselves.

There is scarcely a limit to what engineers can do if they will really work to a common end. Even if they were to limit themselves to efforts to stabilize industries and to eliminate waste, they could perform a national service of first magnitude and indirectly benefit themselves immeasurably, he believes. Only a little progress along these lines would have to be made before unemployment among engineers would disappear, in his estimation.

Dean Cooley points out that it is well understood why engineers, as a whole, have so few collective accomplishments to which they can point. It goes back to the schools, he says, where there is failure to give the engineer a well-rounded education. As a result, he stays within the narrow boundaries of his specialty. With the example of the spirit and point of view of such engineers as Herbert Hoover, Dean Cooley believes there is going to be a general breaking away from the meshes of technicality and that engineers are going to utilize the ability they already possess as economists and businessmen and become men of affairs.

Air Service to Hawaii

That an inter-island airplane mail and passenger service may become a reality in the Hawaiian Islands was indicated by a letter received recently by the Honolulu Chamber of Commerce from C. A. Webb, of San Francisco, who asked for particulars regarding the possibility of establishing an aerial line between the islands.

Franklin Institute Awards

The Franklin Institute, Philadelphia, Pa., acting through its committee on science and the arts, awarded on Oct. 19, its Elliott Cresson gold medal to Dr. Byron E. Eldred, of New York, for his development of the low expansion leading-in wire for incandescent electric lamps. At the same meeting, the institute awarded to Alfred O. Tate, of Cranston, R. I., its Howard N. Potts gold medal for electrolytic process of waterproofing textile fabrics.

After these medals had been presented by Coleman Sellers, Jr., vice-president of the institute, Ralph Modjeski, chief engineer of the Delaware Bridge Commission, delivered a lecture. His subject was "The Delaware River Bridge Between Philadelphia and Camden."

Gov. Allen to Address Engineering Societies

A public meeting under the auspices of the New York sections of the four national engineering societies on the subject of the St. Lawrence ship canal and power project will be held in New York City on Monday, Nov. 14. W. L. Saunders is chairman of the committee; this is one of a series of joint meetings arranged by the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers and the American Institute of Electrical Engineers.

Governor Henry J. Allen of Kansas will be one of the speakers. Dr. R. S. MacElwee, former director of the Bureau of Foreign and Domestic Commerce, now director of the School of Foreign Service, Georgetown, University, Washington, D. C., will also speak.

Build New Shops on Ashes of Old

Work has been started on tearing down the old buildings at the American Car and Foundry Co., at Terre Haute, Ind., which were partially destroyed by fire some time ago. When the old buildings have been wrecked and taken away work will begin on the construction of the new buildings, according to the announcement made by E. D. Buick, district manager. The new buildings will house the machine and blacksmith shops.

No attempt will be made to re-open the car shops until the building has been completed. However, a number of men were given employment in tearing down the buildings and more will be employed in building the new shops.

Machinery at Indianapolis Exposition

The Indianapolis Industrial Exposition which was held in that city from Oct. 10 to 15, was one of the most successful, from the manufacturers' standpoint, ever conducted under one roof. The affair was conducted by the Indianapolis Chamber of Commerce. It was arranged by O. B. Iles, chairman of the Manufacturers' Committee of the chamber, under the direction of Charles F. Coffin, president of the chamber.

Machine-tool builders and dealers were prominent among the exhibitors, machinery being one of the most important industries of the city.

Some of the machinery builders and dealers who exhibited were: Huetter Machine and Tool Co., International Machine Tool Co., Eastern Machine Works, Marschke Manufacturing Co., Millholland Machine Co., Pearson-Scott Co., Rice Manufacturing Co., Stevenson Gear Co., Vonnegut Machinery Co., J. D. Adams & Co., Allison Engineering Co., Climax Machinery Co., The Electric Machine Co., Fairbanks, Morse Co., E. C. Haupt Co., Hetherington & Berner, Indiana Air Pump Co., Mansfield Engineering Co., Meier Electric and Machine Co., C. & G. Potts Co., Shoaf Cutter Co., and the Universal Paper Co.

Education Discussed at Dayton

The Trade and Industrial Section of the Ohio State Teachers Association has just closed its annual conference, held this year at Dayton, Ohio. The meeting was held in the schoolhouse of the National Cash Register Co., and at the invitation of John H. Patterson, president of the company. About 100 men and women attended.

Eminent speakers addressed the meeting, the subjects all bearing on industrial trade apprenticeship, vocational education and soldier rehabilitation. A comprehensive account of the conference is contained in the vocational bulletin of the Woodward Technical High School, at Dayton, and edited by Lawrence Parker.

Meeting Postponed

It has been announced that the semi-annual meeting of the American Iron and Steel Institute, which was to have been held in the Hotel Commodore, New York, on Oct. 28, has been postponed until Nov. 18. It is understood that the delay is due to the fact that Marshal Foch, of France, who is to be the guest of honor, would not have reached this country in time.

A. S. M. E. Plans Big Meeting in December

Elimination of industrial waste will be stressed at the annual meeting of the American Society of Mechanical Engineers, to be held in New York City Dec. 5 to 9. The report of the Committee on Elimination of Waste in Industry of the American Engineering Council will provide the basis for the discussion, which will emphasize the engineering phases of the waste problem. The A. S. M. E., in arranging its annual meeting program, follows the recommendations of the committee that each technical society give intensive treatment to the report.

The leading session will point out the necessity for waste elimination and develop essential principles of standardization and stabilization. The professional sections will consider in technical fashion the steps that can readily be taken more effectively to utilize our national resources. The management division of the society will announce the names of the speakers for the leading session in the near future.

The tentative program shows an intimate relation between the leading session and the technical sessions of the professional division. The Aeronautic Division, Ordnance and Forest Products Divisions have not entirely completed their lists of speakers. The Aeronautic Division contemplates a discussion of the economic possibilities of commercial aviation and two technical papers on the materials used in airplane construction, one of these, on cables, will be given by R. R. Moore. The Ordnance Division will present a paper by Colonel J. W. Joyes, chief of the technical staff of the Ordnance Department, in which avoidable wastes in ordnance manufacture will be pointed out. The Forest Products Division will demonstrate how several lumber manufacturers have successfully reduced waste in the various processes involved in the conversion of the log into forest products. The experience of the Southern and West coast districts will be related and the need for still further reduction in wastes will be emphasized.

The limitations of the Engineering Societies Building makes it exceedingly difficult to hold more than three simultaneous sessions. Accordingly, the council has this year granted permission to extend the meeting for five days, and the leading session will be called to order at two o'clock on Monday afternoon, Dec. 5. As a further step to properly utilize every available moment, morning sessions will begin promptly at half-past nine. It is believed that this will reduce the necessity for adjourned sessions.

Two sessions on education will be held, one under the auspices of the Committee on Education and Training in the Industries, which will present a program pointing out the great needs for education in the industries. Dean R. L. Sackett, of the Pennsylvania State College, will present in one of the papers a resumé of the status of industrial education throughout the country. The second paper, by D. C. Buell, of the Railway Education Bureau, Omaha, Neb., will relate the steps taken by the railroads of the country for the training of their men. It is earnestly hoped that this program will bring out discussion that will enable the committee to plan a constructive program for future industrial training.

The second session on education will be a joint meeting with the Society for the Promotion of Engineering Education. Prof. Dugald C. Jackson is in charge of the program, which will give an opportunity for mechanical engineers to discuss with teachers the requirements of an adequate technical school training in mechanical engineering.

A new and important development in annual meeting projects will be launched at the coming convention. The Committee on Relations with Colleges has charge of a session at which the papers will be prepared and presented by students. Discussion will be limited to students and the meeting will be conducted by students.

The honorary memberships which have been granted to Henry R. Towne and Nathaniel G. Herreshof will be formally bestowed on Tuesday evening, following the address of President Carman.

The business meeting has been scheduled for Wednesday, Dec. 7. The entire day will be given over to the discussion of the policies of the society and especially of the new constitution.

A more elaborate program than last year has been planned for this meeting. In addition to the presidential reception, which will be held Tuesday evening there will be a ladies' tea and dance on Wednesday afternoon, an informal get-together dinner for the membership on Wednesday evening, and a dinner dance on Thursday evening. Friday evening will be devoted to college reunions and the following institutions are planning events: Cornell University, University of Illinois, Lehigh University, Massachusetts Institute of Technology, University of Michigan, New York University, Pennsylvania State College, Polytechnic Institute of Brooklyn, Purdue University, Rensselaer Polytechnic Institue, Stevens Institute of Technology, Worcester Polytechnic Institute and Yale University. The ladies' tea will be served Wednesday, Dec. 7, half-past three on the fifth floor of the Engineering Societies Building. The place for the informal get-together dinner on Wednesday evening has not been chosen. An informal program will be given during the smoker which will follow the dinner. The dinner dance will be held at the Hotel Astor. On Thursday a luncheon is planned for members of Sigma Xi honorary scientific society.

Excursions will lead to points of technical interest about New York. Arrangements are being made to provide special railroad rates for members attending the meeting.

Motor Show in India

The Motor Trade Association of Calcutta will hold an automobile exhibition in Calcutta from Dec. 19 to 24 of the current year. In view of the fact that the Prince of Wales is due to arrive in Calcutta on Dec. 24, there is a possibility that the exhibition may continue until the 31st. Present arrangements call for the erection of 45 buildings especially suited for exhibition purpose, electric lighted and with tile roof. If the demand for space warrants, additional buildings will be erected. P. H. Moseley is Vice-Consul at Calcutta.

Safety Code for Elevators Prepared by A. S. M. E.

After five years of effort, and with the co-operation of the industrial boards and other organizations and individuals in many states, the Committee on the Protection of Industrial Workers of the American Society of Mechanical Engineers has completed the preparation of a Safety Code for Elevators. This code, representing another striking phase of the society's professional endeavor on a nationwide scale, is analogous to the A. S. M. E. Boiler Code, and, like it, was developed for the purpose of incorporation into law by the state legislatures.

California, Texas, Ohio, Maryland and Massachusetts are among the states, it is announced at the national headquarters of the society, that are now considering the code as the basis for legislative enactment. The work of the committee has attracted universal interest, and confidence is felt that the undoubted need for the code as well as the thoroughness with which it was formulated will result in speedy and substantial progress in this field.

The committee consisted of John W. Upp, chairman; Magnus W. Alexander, Carl B. Auel, William P. Eales, Carl M. Hansen, John Price Jackson, Byron Cummings, Melville W. Mix, William A. Viall, and Herbert L. Whittemore. Aiding in the preparation of the code, which governs the construction, operation and maintenance of dumbwaiters and escalators, were representatives of the U. S. Bureau of Standards, Elevator Manufacturers Association of the U. S., Elevator Manufacturers Association of N. Y., casualty and fire insurance companies, American Institute of Architects, various related engineering societies, elevator specialty manufacturers and independent engineers. Prof. Clifford B. LePage of Stevens Institute is secretary of the committee.

During the five years in which the Safety Code for Elevators has been developed, the industrial boards or commissions of many states have kept in constant touch with its development. Notable among these are California, Michigan, Ohio, Maryland, Massachusetts, Pennsylvania and New York. Early in the development of the code the Bureau of Standards voluntarily discontinued the work which it had begun on a Safety Code for Elevators and co-operated completely with the work of the committee.

The A. S. M. E. through its Elevator Code, is again brought to the attention of the engineering profession and the public as the agency through which a series of standards are being created. Most of these standards have been very generally adopted by American industries, notably the American Standard Pipe Thread, now available as a publication of the American Engineering Standards Committee, and standards for pipe flanges and fittings. The society's safety codes, particularly the Boiler Code, have been recognized by various state legislatures as the basis for laws safeguarding human life and promoting humanitarian progress.

The Elevator Code comprises seven parts: Hoistway construction for passenger and freight elevators and for dumbwaiters, power passenger elevators, power freight elevators, hand elevators and hand invalid lifts, dumbwaiters, escalators, operating rules.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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There will be no railroad strike. The labor leaders are to be congratulated upon their good judgment. The stock market, which was singularly complacent while the strike threatened, advanced sharply when its abandonment was announced and there are many who believe that a real boom is incipient. In the oil and industrial share department many sharp advances have already been recorded and the railway stocks, which have been held back by the strike talk, should now attract attention.

Meantime traffic has been quickened by the fear that transportation would be interrupted by the strike and both car loadings and net earnings continue to show increases. Freight rates are, moreover, gradually coming down. Transcontinental rates and the rate on iron ore were reduced some weeks ago and last week a reduction of from 10 to 17½ per cent in the rates on grain and feed in the Western territory was ordered. There is an intimation that a reduction in lumber rates will be shortly made, for even the railway managers are coming to realize that a cut in the cost of carrying both passengers and freight would greatly stimulate business.

Trade reports are generally optimistic in tone. Revillon, the New York furrier, says that "it is almost impossible to fill orders." The President of the American Radiator Co. claims that they are doing the largest business in their history. The United States Chamber of Commerce announces a decided improvement in the industrial situation generally. In a speech at Atlantic City Charles M. Schwab prophesies the greatest boom in American history. Many similar statements from all over the country could be quoted did space permit. The Harriman Bank asserts that not more than one million persons are now unemployed and the *New York World* of last Monday published twelve columns of "Help Wanted—Female," and seventeen columns of "Help Wanted—Male" advertisements. The other papers also carry an unusually large number of help wanted advertisements.

In the West some reduction of purchasing power is expected as a result of the decline in grain, but when I was in Chicago last week the merchants that I saw there told me their trade was surprisingly good. In the South the feeling is distinctly cheerful and in the textile industry there as well as in New England there is practically no unemployment.

Cotton has become comparatively static at between 18 and 20 cents. Around this level the minds of buyers and sellers seem to have met. The dry goods market is gradually adjusting itself to the advance in the raw material and while there is no boom the offtake is about equal to the production. The demand for woolen goods is excellent and higher prices for raw wool have been paid at the auction sales recently held in London, Australia and New Zealand.

Rubber is rather firmer and increased activity in the factories of the Akron district is reported. A better demand for leather is also to be noticed. The production of crude oil is gradually increasing. The bituminous coal production for October promises to be the largest of the year. There is a better demand at a slight advance in price.

An increase in building activity in many sections is also reported. Steel rails have been reduced $7 to $40 a ton and the best authorities agree with R. H. Sweetser of the Southern Ohio Association in believing that a real revival of the steel industry only awaits the expected reduction in freight rates.

The cheerfulness to be inferred from the foregoing has not been seriously affected by the expectation that there will be much illness in the country during the coming winter now that real beer and wine are procurable on a doctor's prescription.

Like the eel that got used to skinning, the business community is becoming somewhat indurated to the procrastination of the Senate over the tax bill and as almost anything is better than the present uncertainty there are many who are commencing to hope that the revision of taxes may be delayed until after the election of 1922. The tariff bill seems to be entirely moribund. The weekly Federal Reserve statement shows a gain of 13½ millions in the gold held and a reserve ratio of 70.8, the highest since September, 1917. Money is daily becoming cheaper and further reductions in Federal Reserve rediscount rates are generally expected.

The quoted rate on commercial paper is 5¼ per cent but this can probably be shaded by borrowers of undoubted credit. Two hundred million treasury certificates offered at 4¼ per cent for those maturing April 1, 1922, and 4½ for those due Sept. 15, 1922, have been enormously oversubscribed. The bond market is firm and new issues aggregating nearly $100,000,000 were easily absorbed during the week.

As the notables from the Orient and Europe arrive to attend the Disarmament Congress hope of an agreement that will really make war a remote possibility is revived, despite a dispatch from London announcing that 5 per cent was charged and paid at Lloyds to insure against war between the United States and Japan before Dec. 31, 1922. Another policy written at Lloyds last week has attracted international attention. It insures against transfer of any part of the British West Indies to the United States in payment or part payment of England's debt to our Government on or before Dec. 31, 1922. For this indemnity 15 per cent was paid and the rate would indicate that it is not impossible that the Bahamas, Bermuda, Jamaica and Nassau may soon come under the American flag.

In continental Europe conditions seem to grow more chaotic. German marks could be bought in New York last Thursday at 55 cents per 100. Some cigar stores are giving 50 marks instead of trading stamps with each box of cigars sold. The demand from this source will not, however, go very far in providing a market for the 88 billion marks now outstanding and as their worthlessness becomes understood in Germany their demonetization will be certain. Just what will happen then no one can say, nor is it known whether the reparation payment due November 1st will be met. There are rumors that a postponement has been agreed to by the Reparation Commission pending the arrangement for a German loan which the Rothschilds are said to be considering.

De Valera is still talking, but is gradually making himself ridiculous even in the eyes of his fellow Sinn Feiners and it is unlikely that he can prevent a settlement of the Irish problem at the London conference. It is to be hoped that nothing will occur to keep Lloyd George from coming to Washington.

The Prince of Wales has started for India, where the religious and social unrest seems to be extending. It is hoped his advent may allay it. Lenine admits that individualism is reascendent in Russia and that trade is in consequence reviving. Mr. Lamont of the Morgan firm has returned from Mexico but is silent as to the results of his trip. Inability to agree upon terms for the reajustment of the Mexican debt is inferred but this inference may be wrong. Bankers do not always take the public into their confidence.

The situation in Cuba is improving as the sugar is being sold. An American loan of from five to fifty million dollars is persistently talked of. The smaller amount is said to be arranged for.

Dollar securities are now being dealt in on the London Stock Exchange. The dollar is gradually becoming the money that continental shop keepers prefer and it may be that it will in time become the financial esperanto of the world and so provide a medium in which many of the economic problems that now trouble Europe may be resolved. Meantime growing supremacy of the dollar, plus the inexhaustible resources of the country to which it is indigenous, seem likely to insure our prosperity despite the perplexities of the old world and the clouds which are discernible over seas. It is even thinkable that the centripetal attraction of the dollar may compel a union for the preservation of the world's peace and if this is possible we should miss no opportunity so to use the power that it gives us.

McGraw Heads Publishers

James H. McGraw, president of the McGraw-Hill Co., Inc., was elected president of the Associated Business Papers, Inc., at the annual convention just held in Chicago.

Latvia's Railroads and Their Requirements

By V. Leitis
Riga, Latvia

Latvia and Esthonia are the new small republics on the Baltic Sea, formerly being a part of Russia. Almost all of the important countries, excepting the United States of America, have recognized them *de jure* and they were recently accepted into the League of Nations as full members. By this last event they are recognized as nations which have a stable government, with sound political and economic organization.

Soviet Russia tried to establish her communistic order there, but the Letts and Esthonians developed strong resistance and cleared their boundaries of the bolshevist invasion. Soviet Russia then recognized their rights to independence, made adequate peace treaties, and there is no ground to assume that she will break these treaties in the future. Russia uses both these countries as transit mediums for her import and export goods, and no doubt Latvia and Esthonia are able to keep the necessary harbors and railroads in better condition than Soviet Russia could do it.

Of greatest importance to Russia are the Latvian harbors and railroads. Russia's total commerce in 1912 in the Baltic Sea was:

Port Petrograd	$180,046,000
Port Riga, Libau and Vindow (present ports of Latvia	261,881,000
Port Reval (Esthonia)	51,332,000
Total	$493,259,000

Thus 53 per cent of the whole of Russia's Baltic Sea trade went through the present Latvian port.

The present Russian trade is small; but the time will arrive when it will have grown to large proportions, and then the Latvian harbors and railroads will be obliged to work up to pre-war capacity if the new republic of Latvia wishes to keep her independence. It is necessary that Russia have comparatively free outlet to the Baltic Sea, and so long as the republics of Latvia and Esthonia will satisfactorily play the rôle of transit mediums, it is possible that there will be peace between them and Russia. If, on the contrary, Russia tries to sieze the Baltic ports and railroads then Latvia and Esthonia would perhaps loose their independence. Besides such a probability the income from Russian transit forms a considerable part of Latvia's budget, and Latvia is keenly interested in raising the capacity of her railroads and harbors to the highest possible degree.

During the war, Latvia suffered greatly from German and Russian invasion. The Germans seized all they found and sent it to Germany, and the Russians in order to prevent the Germans from such acquisitions, sent all they could find to Russia. Thus almost all the factories in Latvia were evacuated. Although by the peace treaty Russia is compelled to return all the machinery taken from Latvian factories, it is difficult to find, assemble and ship this equipment. Most machines in Russia are broken and worn-out and it would not pay to re-ship them. Formerly in Latvian cities hundreds of thousands were engaged in industry, today there are possibly only ten thousand. As the wages and costs of living in Latvia are comparatively low, some foreign capitalists are prepared to open factories there, using the empty buildings.

The railroads, of course, suffered heavy; some bridges were blown up, locomotives and cars driven away and the railroad buildings destroyed by fire. By the peace treaties, Russia and Germany agree to return a part of the cars and locomotives, but this worn out equipment is not able to serve the heavy traffic which is to be expected in the future.

At present, Latvia is short 501 locomotives and 11,800 cars. As mentioned before, the local factories are closed, their equipment is lost or worn out, and there remains nothing to do but buy all necessary cars and locomotives from foreign countries. Some have already been ordered from the United States. American locomotive and car works should be more interested in the Latvian railroads.

Financially Sound

The question of payments should be investigated separately. But the financial status of Latvia is sound. Although the exchange of the Latvian rouble is low (370 roubles today equals one dollar in American money), but the printed money does not exceed one thousand roubles per inhabitant. The amount of gold in reserve is not small, but the debt in foreign countries is not big and there are negotiations with foreign capitalists to open—together with the Latvian government—an emission bank. The export of forest products, flax and the customs from Russian transit comprise a steady and substantial income.

In order to understand the actual conditions of the Latvian railroads we must use some detailed figures. The Latvian railroad tracks have four different gages: (1) The Russian, 1525-mm. gage, 1,135 klm. long; (2) the standard, 1435mm. gage, 749 klm long; (3) the narrow, 750mm. gage, 267.7 klm. long; (4) the smallest, 600mm. gage, 567.3 klm. long; this makes a total of 2,809 klm of rail lines.

The standard gage tracks connect with Germany, the Russian with Russia, and the two smaller gage lines serve the interior of the country. The chief task of all these railroads is to take care of the enormous Russian trade.

About 50 per cent of the locomotives in the Latvian railroads are unfit for use, most of them being over 50 years old. As to the condition of the cars, they are mostly worn out and in need of repairs. In pre-war time the Russian railroads had an average of 38 locomotives and 87 freight cars on every kilometer of road. These figures are taken from the estimations of the Ministry of Communication. The desirable type of locomotive should have a wheel diameter of 145 mm. and weigh 70.5 tons full weight, with 14,000 kg. pulling power. The Latvian intends to invite foreign capital to participate in re-establishing the railroad repair shops at Dvinsk, where formerly 1,700 laborers were employed. This shop was cleaned out by the Russians but the spacious buildings are still in good conditon. Russia is sending her locomotives and cars to Latvia for repairs, and these shops could be developed and put on a paying basis with the aid of foreign capital.

Switzerland as a Market for American Goods

American manufacturers and exporters are overlooking an important field for business development in Switzerland, says American Trade Commissioner H. Lawrence Groves in a special survey of the markets of that country published last week by the Bureau of Foreign and Domestic Commerce of the Department of Commerce.

In his report, published as a convenient handbook of Switzerland, the commissioner calls special attention to the increased importance of that country as a financial and a commercial center. He says that Switzerland, located in the heart of Europe, is essentially an industrial nation, almost entirely lacking in raw materials. Consequently, its many industries are dependent on foreign countries for supplies of raw materials as well as for many semi-manufactured and finished products. In his opinion, the supplying of these commodities is of sufficient importance to merit much more intensive consideration than heretofore accorded on the part of our exporters.

The report is devoted to Switzerland, exclusively. It reviews the country's industries, finances, natural resources, markets, etc. Conspicuous facts in its foreign trade are mentioned specifically. There is also information about advertising, credit and transportation agencies, and other similar trade factors.

The complete report is known as "Special Agents Series No. 210—Switzerland—A Commercial and Industrial Handbook." Copies can be purchased at 40 cents each from the Superintendent of Documents, Government Printing Office, Washington, D. C., and from the district and co-operative offices of the Bureau of Foreign and Domestic Commerce.

To Build Two-Ton Truck

The Hampden Motor Truck Corporation has been organized with $1,000,000 capital to engage in the manufacture of two-ton trucks. A site of eight acres has been purchased in Willimansett, Chicopee, Mass., and a contract will be awarded within a few days for a one-story brick factory with a frontage of 633 ft. on the Boston & Maine tracks, and comprising about two acres of floor space. It is purposed to build only one model of truck, with selling price around $2,000, and to be ready for production by next spring. In the meanwhile several cars will be built in time for exhibition at the January shows.

It is the aim of the company to eliminate surplus costs all along the line. The truck, though not built primarily for speed, will be of somewhat lighter design than is usual for a vehicle of that capacity. Concentration on one model is expected to be a further element of economy, and distribution will be simplified by selling direct through established dealers. A number of original ideas in construction are planned.

The corporation is composed entirely of Holyoke men, with these officers: President, R. D. Bloom; vice-president, John F. Lynch; treasurer, Ernest S. Steele; directors, R. L. Davenport, John H. Woods, C. H. Collins, F. G. Burnham and C. P. Lyman.

Industries of South Resuming Full Capacity

Virtually all lines of business and industry in the Southern field have experienced steady improvement since the early part of October, while the unemployment situation is better than it has been in several months, due to the increase in operations at many of the industrial plants. It is generally believed that production as a whole will have attained normal by the early part of 1922.

Building operations got started rather late in the Southeast, but construction activity is making excellent progress in many sections. Conditions in this regard are especially good in Atlanta and Birmingham, where new records are being established this year in home building.

The lumber industry of the section is in better condition than it has been in more than two years. The demand for Southern pine has reached a point where it is in excess of production at the southeastern mills, and the hardwood market has also experienced a considerable increase in demand the past three or four weeks. Preparations are being made by many of the larger manufacturers to reopen their mills, most of which have been idle for many months, while those now operating are steadily increasing their capacity. The manufacturers are moving with caution, however, waiting definite settlement of the railroad trouble.

Textile conditions are also on the upward trend and mills of the section are increasing capacity from week to week. Many are now running full force, several operating both day and night schedules.

In Alabama and Tennessee steel fabricating plants are adding steadily to their working forces and experiencing a better demand than in more than a year. The improvement in this regard has been steady for the past two months.

Some Bright Spots

The big steel plant of the American Brake Shoe and Foundry Co., at Chattanooga, Tenn., is running at 100 per cent capacity, while the brake-shoe department is going at 50 per cent. Operations at the plant have been increased as a whole about 25 per cent the past few weeks. At the plant of the United States Cast Iron Pipe Co., also at Chattanooga, operations were resumed in mid-October after nine and a half months of idleness. Other foundries and shops in Chattanooga and throughout Tennessee, most of which have been closed down since last autumn, are preparing to start up again either before the end of this year or early in 1922. Pipe making plants and shops in Tennessee and Alabama are enjoying excellent business, many operating at full capacity. The Iron City Pipe and Fittings Co., of Birmingham, Ala., also went on a full time schedule in October.

Operations have been resumed at the iron mines of the Telford Mining Co., at Shackelton, Ga., with orders enough on hand to insure steady operation for more than a year. The mines have been closed down for the past eighteen months.

A new electric steel furnace being constructed at Cordele, Ga., by the Williamson-Harris Machine Co., as an addition to the foundry and shops, will be completed and ready to make steel castings within the next few weeks.

There are now twelve furnaces in active operation in Alabama, compared with five that were running on Aug. 1. Several resumed during October.

Announcement has been made by officials of the Lock Joint Pipe Co., of New York, that a $50,000 factory will be constructed in Atlanta to serve the southeastern territory. This company makes re-inforced concrete pipe, and now has twelve factories in Canada and the United States.

Automotive Boom in Michigan

It is reported that the Continental Motor Corporation at Muskegon, Mich., has closed a contract to supply Durant Motors, Inc., with $12,000,000 worth of motors, which will add at least 2,000 employees to the plant in that city.

Calls were sent out on Oct. 25 for the return to work of 500 employees of the Oakland Motor Car Co. at the Pontiac, Mich., plant.

Attacking the Machine Age

(From the *Toledo Blade*)

Following one Butler of lively imagination, another wag attacked the Machine Age, which is our time and generation. He has written a five dollar book on the text that machinery is an abomination, its products all evil, its developments highly damaging to the human race.

The conditions of life, he says, are adjusted to the machine, and not the machine to life. A point that might be disputed. The machine, he declares, replaces brains. If it replaces anything, we would say, it is physical drudgery. He proceeds to say that man is the slave of the machine. We are particularly ready to admit that to be true at the moment the alarm clock goes off.

Such a thesis would carry much weight if any country, any section or any community which is barren of machinery, could be pointed out as happier, more intelligent, more kindly, more tolerant, more productive of superior humanity, than countries and districts in which life depends upon machinery. There is no country, no section or community, thus wanting in mechanical equipment which has any advantage as a living place over any place encumbered of machinery. The districts which in the United States have the least machinery are those in which such societies as the Ku Klux Klan most actively flourish. In these same districts there is economic stagnation. There is the poverty which weighs upon the soul. There is a higher percentage of imbeciles than elsewhere. There is insanitation, suspicion, hatred, physical and moral woe of the ugliest.

The best cure we know of for one who is pessimistic about the Machine Age is a visit to some of our machineless districts. We commend the excursion particularly to women who are fascinated by the writings of iconoclasts who get five dollars for their books. They will find that the lot of the woman in these simple spots is first that of the breeder, then that of the drudge. Neither as the one nor as the other does she accomplish anything very satisfactory.

Hearings Continue on Metric Bill —Proponents Heard

Hearings on the metric system bill were resumed on Oct. 24. The subcommittee of the Senate will continue to hear witnesses who favor the adoption of the metric system. Witnesses who favor the retention of the English system and who as a consequence are opposed to the bill introduced by Senator Ladd, will be heard after the metric system advocates have made their initial presentation.

Henry D. Hubbard, secretary of the Bureau of Standards since 1901, appeared in behalf of the legislation. Among other things he said: "The time has gone when we are content to include under weights and measures merely the pound, the yard and the bushel. We now measure light, heat, electricity, refrigeration, steampower, ventilation and all the countless properties of materials. The far reaches of measurement have extended into fields a thousand times more difficult than the mere measuring of the volume of a particle of grain or the measurement of a length of fabric."

Mr. Hubbard then took up the history and a technical description of the metric system. After he had proceeded for sometime, Senator McNary, the chairman of the committee, interrupted to say: "I want to keep the record down to the consideration of this bill. This is all interesting but it has no purpose in this hearing. If you care to supply for the record a statement of historical phases of the system, you may do so, but it is discouraging that we cannot keep near the purposes and aims of this bill and discuss its feasibility and practicability. A technical or historical discussion does not help us to an understanding of the problem that is before the committee."

Present System Inadequate

In reply Mr. Hubbard said: "Our present system is inadequate. It does not begin to meet and cannot hope to meet the needs of scientific work. That was recognized years ago. The present system has been found as exhibited by the typical case of the bushel, to be of appalling complexity, and with respect to the ton, introducing the most diverse and confusing misunderstandings."

A Record Breaking Professor

E. B. Bingham, professor of chemistry at Lafayette College, and chief chemist Malitor of Carl E. Schmidt & Co. appeared in favor of the bill. Chairman McNary asked Prof. Bingham how long it would take the average man to familiarize himself with the metric system. Prof. Bingham's estimate was half an hour. This led Senator McNary to say. "You hold the record for educational results." Mr. Malitor declared that the system is a requisite in the development of foreign trade. Senator McNary stated that he had heard of many essentials to the acquisition of foreign trade, but that this was the first time he had heard that this expansion is dependent upon the introduction of the metric system.

Since so many of the witnesses in favor of the bill have been chemists, Senator McNary has expressed the hope that representatives of other activities will be brought forward to testify.

Safety Council Elects Vice-Presidents

The executive committee of the National Safety Council at its first meeting following the Tenth Annual Safety Congress, held recently in Boston, elected the following vice-presidents for the coming year: David S. Beyer, Boston, vice-president for service to members; B. F. Tillson, Franklin, N. J., vice-president for industrial safety; F. A. Davidson, New York, vice-president for sectional activities; C. B. Scott, Chicago, vice-president for local councils; David Van Schaack, Hartford, Conn., vice-president for public safety; W. E. Worth, Chicago, secretary and treasurer.

W. H. Cameron, formerly secretary-treasurer of the National Workmen's Compensation Service Bureau, New York, was elected executive secretary of the council. Mr. Cameron, who on Nov. 1 will assume charge of the headquarters of the National Safety Council at Chicago, returns to a post which he held from 1912 to 1919. Sidney J. Williams was re-elected chief engineer of the council. C. W. Price, formerly general manager, will assist the National Safety Council as a special consultant in public safety.

The executive committee approved the organization of a Drop Forge Section and a Petroleum Section.

A Brief Statement from Canada

SPECIAL CORRESPONDENCE

Things are very much unsettled just prior to the Dominion election to be held on Dec. 7. With the revision of the tariff as the big issue, and farmers all over the country clamoring for a lower tariff, manufacturers are necessarily going a little slow until they know what is going to happen. This situation, in addition to somewhat depressed business conditions generally, has a tendency to hold up all construction work, especially factory building. We are hoping things will get straightened away by spring.

Business Items

The Engineering Society of Western Massachusetts had its October meeting at the Strathmore Paper Company's Woronoco mill, on Oct. 23, with 90 members in attendance. George E. Williamson, president of the society and chief engineer for the company, accompanied by mill executives, showed the party through the plant, which affords an excellent example of the most advanced type of machinery for the manufacture of fine quality writing paper. The hydro-electric power plant and steam turbine run by fuel oil were interesting features. Later there was a motion picture exhibition showing the processes of making paper at the mill and other films of interest to engineers and manufacturers.

The Instant Freezer Corporation, Springfield, Mass., incorporated last May, has closed a contract with the Victor Saw Manufacturing Co., of the same city, to produce 25 freezing machines a month. Work under this contract will being at once. The freezer is designed to be used on soda counters. It is of metal construction and has two five-gallon receptacles for cream. Operating power is furnished by an electric motor of ½ hp. The corporation intends to increase its capitalization from $25,000 to $500,000. Officers are: President, Paul Werder; vice-president, Wallace McHolt; secretary, George Drabble; treasurer, Harold Kittenger.

The Newburyport Metal Stamping Co. has been incorporated at Newburyport, Mass., to manufacture metal stampings and tools. W. F. Runnells, N. Russell and W. G. Fisher are among the directors.

The Lovejoy Manufacturing Co. has been organized at Brookline, Mass., to make automobile accessories. Incorporators are R M. Lovejoy, O. E. Leighton and H. B Shepard.

Incorporation of the Carter Motor Car Co., with a capitalization of $2,000,000, has been announced at Washington, D. C. The company was incorporated under the laws of South Dakota by L. L. Stephens, Frank L. Carter and A. Gary Carter. Buildings formerly occupied by the Washington Motor Car Co., at Hyattsville, Md., have been taken over for a factory. The advance notices issued by the incorporators state that a small car will be marketed at an attractive price. The car will be equipped with easy riding comfort springs, the patent for which is controlled by the incorporators.

The New England Tire and Rubber Co., South Holyoke, Mass., starts production this week in its new factory and purposes to attain an output of 300 tires and tubes daily within two months. Capacity of the factory is 1,000 tires and 1,500 tubes daily. Factory branches have been established, in New York, Newark, Washington and Boston.

The Henshaw Motor Co. has been organized at Boston, Mass., and incorporated for $600,000. Automobiles, parts and accessories will be made.

The Sun Machinery Co., has bought the building at 28 Mechanic St., Newark, N. J., and will move its office and display room to that address. A warehouse has been procured on Green St. The removal from 103 Commerce St., Newark, was made necessary on account of the tearing down of the building by the City of Newark to make room for a new market. P. J. McManus and William Tunic are the proprietors.

The Burroughs Machinery Corporation, Newark, N. J., builder of hydraulic machinery, has acquired all of the patents, drawings, patterns and machinery of the Charles Burroughs Company. The concern is now operating at 246 N. 10th St., Newark, N. J.

The Collins Motor Car Co., has been incorporated at Boston, Mass. Capital stock, $100,000. Directors are J. T. Collins, A. V. Hiscox and H. L. Legg.

The Cyclone Fence Co., Ltd., of Canada, has secured a Dominion charter and will be a branch plant of the Cyclone Fence Co., of Waukegan, Ill.

The Adams Axle Co., Findlay, Ohio, has been awarded the contract to make all the axles and brake bands for the Durant Automobile Co.

The Oberlin Machinery Co., Oberlin, Ohio, has been incorporated with $30,000 capital. H. W. Ingersoll, J. C. Smith, F. E. Stetson and B. A. Smith are directors

The Crane Co., manufacturer of valves and like supplies, has purchased the plant of the Glenmore Lubricant Co., at Lima, Ohio, and will open a branch factory as soon as alterations are made.

The Crandall-Johnson Co., of Stamford, Conn., has recently been organized and incorporated with a capital stock of $100,000 to engage in repairing and dealing in machinery, engines, etc. The incorporators are Arthur I. Crandall, Stamford, Conn.; M. Johnson, of New Canaan, Conn.; and A. M. Rossberg, of New York City.

Machine-Tool Exports Decline in September

Exports of metal-working machinery continue to decrease. The value of all exports of this class of machinery fell to $626,186 in September. This is less than one-fifth of the value of the exports in September, 1920, and is about one-eight of the monthly rate maintained in 1919.

The only favorable deduction that can be made from the September figures is that exports increased to Argentina and to Brazil, but the volume of business done with those countries was small. The detailed figures, which are those of the Bureau of Foreign and Domestic Commerce, follows:

	September, 1920	September, 1921
Metal-working machinery:		
Lathes	$50,781	$65,093
Other machine tools	1,176,175	218,339
Sharpening and grinding machines	333,844	65,886
All other	1,190,343	276,868
Total metal-working machinery	3,207,143	626,186
Exported to:		
Belgium	188,100	14,523
France	452,936	99,742
Italy	120,958	8,481
Netherlands		13,302
Norway	7,860	1,206
Spain	24,684	5,400
Sweden	33,038	1,389
United Kingdom	649,017	101,646
Canada	419,964	51,028
Mexico	37,350	34,822
Cuba	86,350	18,094
Argentina		9,821
Brazil	25,454	47,112
Chile	5,971	3,251
China	309,062	11,004
British India	83,249	11,366
Dutch E. Indies		16,202
Japan	290,742	83,980
Australia	84,563	10,518
Other countries	387,545	83,299
Imports	September, 1920	September, 1921
Machine tools	$12,703	$2,805

The Hardinge Company, 120 Broadway, New York, has acquired the pulverized fuel department of the Quigley Furnace Specialties Co., Inc., also of New York. The Hardinge concern will continue the policies and methods of the Quigley Co. in the production of fuel systems. The Quigley Co. will now devote its entire forces to the development of refractory specialties.

The Readio Company, Springfield, Mass., has been incorporated to manufacture and deal in vehicles, engines, general machinery and merchandise, and has bought a site in that city for the erection of an automobile repair shop. The principal stockholder is George U. Readio and the officers are: President, Edwin C. Spear; treasurer, Frederick J. Hillman.

It is reported that the H. B. Smith Co., manufacturers of radiators and boilers, Westfield, Mass., is rushed with orders, and has converted a large storeroom into a molding room and has hired additional molders, bringing its payroll to the highest point in its history. The company is exporting to the Orient.

The Rhode Island Crucible Steel Co., Inc., of Providence, R. I., has recently been incorporated with a capital stock of $100,000, to engage in the general foundry business. The incorporators are Carl A. Hagstom, Carl W. Sverker, A. B. Benson and George C. Hagstrom.

The Ashley Motor Sales Co., has been organized and incorporated in New York to manufacture and sell machinery. C. S. Ashley, W. J. Llewellyn and R. W. Ashley are mentioned as directors.

The Insulation and Specialty Corporation of America has been organized at Wilmington, Del., with P. C. Hennig as president. The new company is engaged in the manufacture of "Fibre Granite," an insulating material said to be more efficient and quicker to produce than any other on the market. The company's offices are now at 5154 Dupont Building.

A certificate of incorporation has been issued to the American Chain Shops, Inc., of Holyoke, with a capital stock of $25,000. Samuel Garlitz is president of the company.

A voluntary petition in bankruptcy was filed Saturday, Oct. 15, at Birmingham, Ala., by the Birmingham Steel Corporation, liabilities being listed at $262,529 and assets at $235,000. The assets include mainly real estate, buildings and machinery. According to H. L. Brittain, president of the corporation, the shipping board is the principal creditor. He stated that efforts will be made to adjust the matter immediately in order that operations at the plant may be carried on.

Construction work has begun on the main building of the Agricola Pipe Shop, at Gadsden, Ala., the previous structure having been entirely destroyed by a recent fire at a loss of about $125,000. Only the main building was destroyed, the machine shops and the pattern shops escaping damage.

Loss estimated at about $40,000 was caused recently when fire originating in the oil tank section destroyed the new plant of the National Forge Co., at Anniston, Ala. The plant was established only this year.

Personals

D. McCALL WHITE has resigned as associate vice-president of the La Fayette Motors Co., Indianapolis, Ind. No successor will be appointed.

M. H. ROBERTS, chief engineer of the Franklin Railway Supply Co., Inc., New York, is chairman of a board of engineers recently appointed by Director H. Foster Bain of the Bureau of Mines to study the production of helium in Texas. Prof. W. L. DeBaufre of the University of Nebraska is also serving on this board.

FRANK L. ROWLAND, assistant treasurer and office manager of the Gilbert & Barker Manufacturing Co., West Springfield, Mass., is conducting a course of twelve lessons in office management under the auspices of the Massachusetts State Department of University Extension.

LEONARD W. KEARNS, prominent in the leather belting industry, has affiliated himself with the sales organization of the Chicago Belting Co., Chicago, Ill. Mr. Kearns has been active in the leather belting business for twenty-one years. He has specialized in the belting requirements of saw mills, steel mills, wood-working plants, flour mills and machine shops and is a practical belting engineer.

EDWARD F. SMITH, for many years president of the Greenfield Machine Co., Greenfield, Mass., until that concern was merged in the Greenfield Tap & Die Corporation, has resigned his position with the corporation and is on a vacation in the West.

RALPH M. BARSTOW, general sales manager for the Greenfield Tap & Die Corporation, Greenfield, Mass., has been appointed lecturer on salesmanship for the State Department of University Extension. He is also the author of a course of study on the subject, to be used in the university extension work.

HENRY ATWATER, secretary-treasurer of the Columbia Nut and Bolt Co., of Bridgeport, Conn., was nominated last week by the Democratic party to run on that ticket for Mayor of Bridgeport at the election in November.

SOL MOONEY, has recently been chosen secretary of the Atlas Iron Works, Inc., of Bridgeport, Conn.

JOHN L. TAYLOR, salesman for L. F. Seyfert's Sons, Inc., Philadelphia, Pa., has resigned and established himself as a dealer in machinery at 6315 Torresdale Ave., Philadelphia.

L. J. HOY, for several years a salesman with the Eastern Machinery and Equipment Co., Philadelphia, has resigned his position to take charge of the used machinery department of the Sherrit & Stover Co., 2006-8 Market St., Philadelphia.

FRANK S. MILLS has sold his interest in the Ware Foundry Co., Ware, Mass., of which he was superintendent up to Jan. 1 of this year.

FLOYD W. PARSONS, formerly editor of *Coal Age*, and for the past two years in charge of the "Everybody's Business" department of the *Saturday Evening Post*, has become editorial director of the *Gas Age-Record*.

W. D. SHAMBROOK, formerly of the firm of W. D. Shambrook & Co., Hamilton, Ont, has been appointed president of Duro Aluminum Ltd., of that city.

ALAN A. WOOD, for a number of years connected in an engineering and sales capacity with the Providence plant of the Builders Iron Foundry and the Diamond Machine Co., associated companies, is now sales manager of the Philadelphia district, having an office at 419 Widener Bldg., Philadelphia.

J. PHILIPS BIRD has resigned as general manager and assistant treasurer of the National Association of Manufacturers. It is said he will engage in private enterprise in the East.

CHARLES E. STONE, a pioneer in the motor truck engineering field is sponsoring a new association known as the "Society of Motor Transport Engineers." Mr. Stone was one of the founders of the Motor Truck Manufacturers Association in 1907, and the Motor Truck Association of America in 1910.

FREDERICK A. GOTIER, formerly with the Buick and Cole organiations, has been selected to represent the new Bradford Motor Corporation, distributer of the Studebaker cars in Albany, N. Y.

COL. CURRIE, president of the Imperial Steel and Wire Mills at Collingwood, Ontario, Canada, states that the plant which has been closed for some time will resume operations shortly.

ARCHIBALD WRIGHT, for 27 years with the Clare Bros. Foundry, at Preston, Ontario, Canada, has been appointed factory inspector by the Provincial Government.

COL. ROBERT STARKE, of Starke-Seybold Co., Montreal, Canada, has been appointed to the board of directors of Argonaut-Gold, Ltd.

W. Q. SIGSBEE has been appointed manager of the Canadian branch factory of Ace Chain, Ltd., to be located at Hamilton, Ontario. The firm is affiliated with the Ace Chain Corporation of New York.

A. SCHOEN, of Detroit, Mich. manager of the Honolulu Irons Works, has been appointed a director of the Peninsular Sugar Co., which will erect a new $1,250,000 refinery at Petrolea, Ontario. F. H. Hubbard, of Ottawa, Ohio, manager of the Ohio Sugar Co., has been appointed vice-president.

C. J. MORRISON, for the past two and a half years executive assistant to the president of the Atlas Tack Corporation, Fairhaven, Mass., has resigned.

DEAN J. DEBUTTS has resigned as manager of the Dallas, Tex. office of F. W. Freeborn Engineering Corporation, to accept an interest in the Knapp-Ritzmer Co., Inc., construction engineers, with headquarters in New York.

PRESTON M. SMITH has recently been appointed general sales manager of the Manthey-Zorn Laboratories Co., Cleveland, Ohio.

G. EDWARD BARNHART is now vice-president and consulting engineer of the Barnhart Aircraft Inc., Pasadena, Cal.

YOZO TAMURA, representing the South Manchuria Railway, has arrived in this country to place orders for several millions dollars worth of American machinery, rails and rolling stock for delivery in the next few years. His headquarters are at New York.

M. H. CHRISTOPHERSON, for a number of years general works manager for the Otis Elevator Co., in charge of the Ordnance Works, Chicago, is now New York State Deputy Industrial Commissioner located at 124 E. 28th St., New York. He still retains a connection with the Otis Company as consulting engineer.

C. V. DAVIS, formerly in charge of the publicity department of the McClary Manufacturing Co., London, Ontario, Canada, has been appointed district sales manager for the Solex Co., Ltd., with headquarters at Winnipeg.

Obituary

ALEXANDER S. PURDY, aged 62, president and founder of the firm of Purdy-Mansell, Ltd., Toronto, Canada. plumbing and steamfitting supplies, is dead at London, Canada.

E. W. B. SNIDER, president of the Anthes Foundry Co., Toronto, Canada, and prominently connected with the Waterloo Maunfacturing Co., of Waterloo, died at his home at Kitchener, Ontario. He was one of the pioneer workers for hydro-power development in Canada.

WINTHROP G. BUSHNELL, fifty-seven years old, a director of the Delaware Aircraft Co., and a prominent manufacturer in New England, died in New Haven, Conn., on Oct. 23. His father, Cornelius Bushnell, financed the building of the "Monitor" during the Civil War.

ROBERT L. AHLES, president of the Sweets Steel Co., of Wiliamsport, Pa., died at his home in Westbury, Long Island, N. Y. He was at one time associated with the Hewitt interests in the operation of blast furnaces in New Jersey.

COL. SPENCER BORDEN, for many years associated with Thomas A. Edison, and a well known manufacturer of mechanical and electrical devices, died at his home at Woodstock, Vt., on Oct. 17. He was 72 years old.

JOHN M. W. JORDAN, who has been connected with the R. Hoe Printing Press Co. for forty years, died on Oct. 20 at the Swedish Hospital in Brooklyn, following an operation. He was 60 years old. He was in charge of stereotyping machinery production at the Hoe plant.

JOHN WITTMAN, age 65, president of the Atlas Brass Foundry, Columbus, Ohio, died on Oct. 17 at Worthington, Ohio. He had been ill for two years.

DAVID HALL REDDIE, sales manager for Smith & Wesson, revolver manufacturers, Springfield, Mass., died from an attack of apoplexy Oct. 13. He was stricken in the factory. He was 54 years old and had been a resident of Springfield for eight years. For many years he was a buyer for the Biddle Hardware Co. of Philadelphia.

Book Reviews

The Aircraft Handbook. By Fred H. Colvin, editor, *American Machinist*, and Henry F. Colvin, member, Franklin Institute. Second edition, revised and enlarged, 415 pages, with many diagrams, charts and illustrations. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York City. Price $4.00.

This is the second edition, under a slightly changed title, of the "Aircraft Mechanics' Handbook," brought out by Fred H. Colvin during the war. The present volume represents a thorough revision of the original text which suffered somewhat from the haste necessary to publish it in time to be of service to our air program during the war.

New sections have been introduced dealing with the subjects of instruments, international air laws and landing fields. The other topics covered include simple airplane theory, materials of construction, rigging theory and practice, the airplane engine with detailed information regarding leading American makes, engine trouble-shooting, military equipment and S. A. E. standards. A few useful tables and a glossary of aeronautic terms will be found at the end of the book.

Mechanism. By Robert McArdle Keown; B. S.; engineer, Industrial Commission of Wisconsin; formerly associate professor of machine design, University of Wisconsin. Second edition, 173 pages, 172 illustrations, 6 x 9 in. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York, N. Y.

The volume is intended as a textbook on mechanism for use in both the classroom and the drafting room. It covers the subject briefly, simply and clearly. The subject matter is very well arranged, to enable the ready grasping of it by students. The chapters are broken up into numbered sections. Definitions and rules are printed in italics, to call attention to their importance. Illustrations are freely used. At the end of each chapter problems are given, some being for classroom and some for drafting room use.

The book can be recommended as giving a thorough and yet brief treatment of the subject of Mechanism. Its scope is well shown by the chapter headings, which are as follows: Motions and Velocities; Instantaneous Centers, Kinematic Chains; Solution of Relative Linear Velocities by Centro Method; Velocity Diagrams; Parallel and Straight-Line Motion Mechanisms; Cams; Gearing; Bevel Gears, Worm and Worm Wheel; Gear Trains; Belting; and Intermittent Motions.

A. S. T. M. Standards. The 1921 edition of the triennial volume issued by the American Society for Testing Materials is a book of eight hundred and ninety 6 x 9-in. pages, giving standard specifications for practically all materials commonly used by the various branches of the engineering profession, and describing methods and apparatus for inspecting and testing many of them. To the busy engineer who wants his materials to meet definite requirements, yet has little time in which to work out an elaborate specification sheet to cover each case, the book is invaluable. It is published by the American Society for Testing Materials at 1315 Spruce St., Philadelphia, Pa. The price in cloth binding is $10.

Pamphlets Received

Industrial Indianapolis: A souvenir pamphlet of the Indianapolis Industrial Exposition, held in that city Oct. 10 to 15, 1921. It contains a comprehensive review of facts and figures concerning "Made in Indianapolis" products and the business and industrial life of the city. It is issued by the Associated Employers of Indianapolis, Inc., 1406 Merchants Bank Bldg.

Direction By Two Ears: Research narrative No. 18 issued by Engineering Foundation, 29 West 39th St., New York City. A brief description of a device perfected by American scientists during the war, for use in ships bottoms as a means of detecting the approach of submarines. The pamphlet was prepared from data furnished by Col. R. A. Millikan, of the California Institute of Technology, who was a member of the Anti-Submarine Board of the U. S. Navy.

Trade Catalogs

Hill Clutch Equipment. Hill Clutch Co., Cleveland, Ohio. Circular No. 17, describing a system of Hill clutches as used in the plant of the American Cotton Oil Co., at Memphis, Tenn.

Yarway Valves. Yarnall-Waring Co., Philadelphia, Pa. Small pamphlet No. DT—1601, describing the new Yarwin double-tightening valves for use on acid lines, soot blowers, locomotive and pneumatic service.

Standard Fuel Oil Engine (horizontal type). The Hadfield-Penfield Steel Co., Bucyrus, Ohio. Catalog, 24 pages, 9 x 11 in., describing the horizontal type Diesel fuel oil engine built in three sizes, 50, 75 and 100 hp. Illustrations of complete engines, as well as individual parts, are included.

Swages and Shapers. Machinery Company of America, Big Rapids, Mich. Catalog No. 33 describing a line of automatic and hand operated swages and shapers for band, circular, gang and frame saws.

Kinite. Kinite Co., Milwaukee, Wis. A twenty-four page, 3½ x 6½-in. catalog. No. 2034. Describing and illustrating the use of this alloy, of steel for shear blades, redrawing tools, blanking dies, embossing and forming dies, broaches, etc.

Standard Fuel Oil Engines (vertical type). The Hadfield-Penfield Steel Co., Bucyrus, Ohio. Describing and illustrating a Diesel type oil engine, manufactured under the Blanchard patents. The engine is built in two cylinder sizes, 50 and 125 hp. per cylinder and in from two to six cylinder units.

Modern Cutting and Grinding. Oakley Chemical Co., 22 Thames St., New York, N. Y. Booklet No. 1042, 4½ x 6½-in. A study and analysis of information on cutting and grinding methods. It deals with practical methods of applying scientific knowledge to every-day shop problems. Tables of cutting speeds, standard measurements, etc., are included.

Brown Pyrometer. Brown Instrument Co., Philadelphia, Pa. A four-page circular, 8 x 10½ in., describing, with illustrations, the latest type of high resistance pyrometer, with improvements consisting of automatic cold junction compensation and means of zero adjustment.

"Shelby" Steel Tubing. National Tube Co., Pittsburgh, Pa. Bulletin No. 17-B, describing the mechanical uses of "Shelby" seamless steel tubing. The booklet is replete with halftones and cross-sectional drawings of various sizes and shapes of tubing.

Chain Furnace and Oven Doors. E. J. Codd Co., Baltimore, Md. Circular describing the new chain furnace and oven doors which are used on metallurgical, glass and chemical furnaces. These screens are said to "keep the heat in and the cold out."

Pratt & Whitney Gages. Pratt & Whitney Co., Hartford, Conn. Catalog describing a line of P. & W. products including precision gages, mikechecks and toolmaker's flats.

"ABC" Fans. American Blower Co., Detroit, Mich. Catalog No. 23, Series 10, devoted to a description of "ABC" air washing and cooling fans and systems for use in factories, schools, stores and homes.

Starters for small A-C Motors. Cutler-Hammer Manufacturing Co., Milwaukee, Wis. Circular No. 2038 describing the new a-c automatic starters with mercury type overload relays. The theory of the mercury interlock is given and a curve included to show how tripping depends on time and the percentage of overloading.

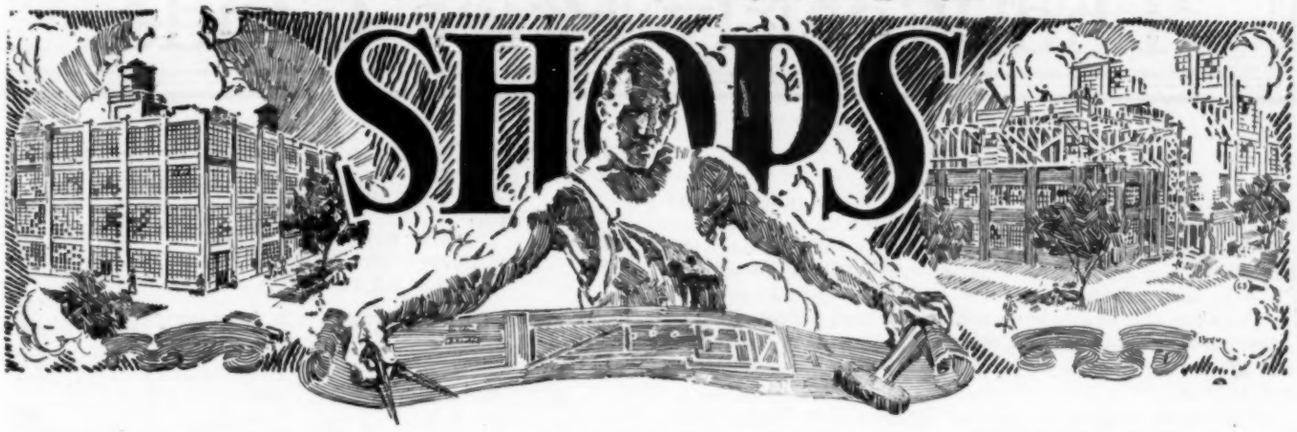
Forthcoming Meetings

The third annual convention and exhibition of the American Gas Association will be held in the Congress and Auditorium Hotels, Chicago, Ill., on Nov. 7 to 12.

The twenty-fifth annual convention of the National Founders' Association will be held in the Hotel Astor, New York City, on Nov. 16 and 17.

The annual meeting of the American Society of Mechanical Engineers will be held in the Engineering Societies Building, New York City, on Dec. 5 to 9.

NEW *and* ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Conn., Hartford—J. Jacobsen, 1074 Broad St.—equipment for garage and auto repair shop.

N. J., Newark—Kreuter & Co., Inc., 571 18th Ave. (manufacturer of tools)—
One 12-ft. Sprague electric hoist, 220 volt.
One double disc wet grinder to take 16-in. ring wheel.

N. Y., Brooklyn — Machine Appliance Corp. 351 Jay St.—one compound rest, screw cutting lathe.

N. Y., New York—Mitsui & Co., 65 Bway. —one Barnes 24-in. self oiling all geared drill press.

La., New Orleans—The Rialto Auto Shop, 1836 Constantinople St.—P. Christophe, Prop.—auto shop equipment including Hacksaw and Hacksaw blades, wire cutters, machine pliers, soldering irons, welding outfit, etc. (new and used).

Ill., McHenry—J. Pint (wagon maker)—several 30 in. square shears and one 8 ft. steel brake.

O., Cleveland—The Royal Brass Co., 1418 East 43rd St.—small punch press, (new or used).

O., Ravenna—J. F. Beyers Machine Co.—one 4-ft. radial drill.

Wis., Eagle River — J. B. Cook — lathes, forges, presses, etc., for proposed machine and forge shop.

Wis., Glenwood City—The Glenwood City Auto Co., J. P. Johnson, Purch. Agt—repair machinery, including drill press.

Wis., Hurley—L. Santi—auto repair machinery.

Wis., Madison—T. Roster & Co., 440 Clemens St.—machinery, including lathes, presses, etc. for proposed machine shop.

Wis., Milwaukee—J. Kost, 339 Clinton St. (tool maker)—one bench lathe.

Wis., Oshkosh—Fonte & Slater Co., 118 Main St.,—presses, air compressors, etc. for proposed garage on Main St.

Wis., South Beloit (Beloit P. O.)—P. F. Mork, 94 State St.—drill press for garage.

Ark., Gravette—T. A. Wisdom—machine shop equipment including lathes, drills, forges, etc. for proposed shop on Main St.

N. J., Camden—The Harbor Committee, Room 11, City Hall—one 3-ton traveling crane, gantry, cantilever, electric; two double-drum portable electric winches; one 4-wheel electric tractor including 8 trailer trucks.

N. Y., Buffalo—The Buffalo Litholite Co., Main and Amherst Sts., G. Hipp, Purch. Agt.—iron planer, bed travel about 8 ft. for planing stone.

N. Y., New York—Eschmann & Loede, 239 Center St.—engine turning machine for watch case work, to make markings, etc. on back of watches.

Pa., Philadelphia—The Baldwin Locomotive Co., Broad and Springgarden Sts., W. A. Russel, Purch. Agt.—traveling derrick, 50 ton capacity

N. C., Glen Alpine—J. D. Pitts (woodworker), H. P. Pitts, Purch. Agt.—one combination ceiling and flooring machine, weight about 6,000 lb., about 6 x 24 without feeding out roll, to match and dress as thin as ⅞ in. and dress 4 sides 14 in. wide (must be in excellent condition).

Va., Richmond—J. G. Skelton, Railway & Power Bldg., manufacturer of machinery—six 36-in. gage, 11 x 16 in. cyl. Vulcan or Porter saddle-tank locomotives and two 30-ton standard gauge saddle tank locomotives with A.S.M.E. boilers.

Ill., Chicago—The Garden City Plating & Mfg. Co., 1434 South Talman Ave.—one ball burnishing barrel.

Ill., Chicago—E. H. Stafford Mfg. Co., 218 South Wabash Ave., (manufacturer of furniture), E. H. Stafford, Pur. Agt.—power veneer press.

O., Canton—The Continental Clay Co., Zinninger Bldg.—$200,000 worth equipment including full line of sewer pipe machinery, plunger presses, drying pans, crushers, etc. for proposed plant in East Canton.

Wis., Beaver Dam—Price & Ruland Co.—power machinery, boilers, etc., for dairy products plant.

Wis., Eagle River—V. Krefl Mfg. Co.—power machinery for proposed 3-story auto accessory factory.

Wis., Luck—G. Grinen—blacksmith shop equipment.

Wis., Milwaukee—J. Auchtfer, 1062 11th St.—vulcanizer and gasoline pumps for proposed garage on Oakland Ave.

Wis., Milwaukee—W. A. Bowers Heating Co., 484 Market St., W. A. Bowers, Purch. Agt.—one 8 ft. tinners brake

Wis., Wagner—E. J. Wagner—belt driven machinery for making cheese.

Kan., Coffeyville—The Bd. Educ., c/o H. E. Martin, Pres.—manual training equipment for proposed 2-story junior high school

Minn., Minneapolis—The Bd. Educ., 305 City Hall, K. E. Alexander, City Purch. Agt.—$25,000 worth equipment for manual training depts. and school shops.

Tex., Mexia—The Texas Mexia Refining Co., Telephone Exch. Bldg., O. H. Foster, Pres. — complete refinery equipment for 3,000 barrel refinery (wants terms; suggests $5,000 cash and balance in monthly payments).

Ont., Petrolea—The Peninsular Sugar Co. F. H. Hubbard, mgr. of Ohio Sugar Co., Ottawa, Ohio, Pres.—equipment and machinery for proposed sugar refinery.

H. I., Honolulu—Loves Biscuit & Bread Co.—baking and conveying machinery for proposed biscuit factory.

Metal Working Shops

NEW ENGLAND STATES

Conn., Hartford—J. Jacobsen, 1074 Broad St., is having plans prepared for the construction of a 1½-story, 80 x 145 ft. garage and repair shop on Broad St. Berenson & Moses, 1026 Main St., Archts.

MIDDLE ATLANTIC STATES

Pa., Economy (Ambridge P. O.)—The Wyckoff Drawn Steel Co. will build a 1 story, 60 x 240 ft. addition to its factory.

Pa., New Brighton—The Standard Mfg. Co., Bessemer Bldg., Pittsburgh, has awarded the contract for the construction of a 1 story, 144 x 180 ft. foundry.

Pa., New Brighton—C. C. and E. P. Townsend Co. has awarded the contract for the construction of a 3 story, 124 x 128 ft. wire mill, warehouse and factory.

Pa., Pittsburgh — Arburthrust Stevenson Co., Penn. Ave., has awarded the contract for the construction of a 1 story 75 x 210 ft. garage on Bidwell St. Estimated cost, $75,000.

Pa., Pittsburgh — McLean & McGuiness, manufacturers of wagon supplies, have awarded the contract for the construction of a 5 story, 40 x 100 ft. factory at 142 Libery Ave. Estimated cost, $45,000.

MIDDLE WEST STATES

Ill., Belvidere—The Belvidere Heating Co., c/o J. Meyers, is having plans prepared for the construction of a 2 story factory. Estimated cost, $55,000. Architect's name withheld.

Ill., Chicago—P. Gerhardt, Archt., 64 West Randolph St., is receiving bids for the construction of a 2-story, 80 x 230 ft. auto service and sales station, at 5725-31 Bway., for Kelley & McLin.

Ill., Chicago—The Hannifin Mfg. Co., 621 South Kolmar Ave., manufacturer of special machinery, is having plans prepared for the construction of a 2-story, 90 x 160 ft. factory on Knox and Wellington Sts. Estimated cost, $200,000. Architect not announced.

Ill., Chicago—R. Munizzo, 2904 South Wells St., has awarded the contract for the construction of a 1-story, 110 x 125-ft. garage on 31st St. and Princeton Ave. Estimated cost, $40,000.

Ill., East St. Louis—C. O. McCasland, 810 Chestnut St., St. Louis, Mo, has awarded the contract for the construction of a 1-story, 70 x 120-ft garage on 10th and Illinois Aves. Estimated cost, $55,000. Noted Oct. 27.

Ill., Elgin—The Elgin Watch Co., c/o C. H. Hulbird, Pres., 10 South Wabash Ave., Chicago, is having plans prepared for the construction of a 4-story, 30 x 374-ft. watch factory, 3-story 40 x 432-ft. dormitory and 3-story 100 x 150-ft administration building. Estimated cost $1,000,000. Postle & Fischer, 140 South Dearborn St., Chicago, Archts.

Ill., Evanston—C. F. Thumm, 2313 Lincoln St., Chicago, has awarded the contract for the construction of a 1 story, 171 x 200 ft. garage. Estimated cost, $85,000.

Ill., Harvard—Cowen & Obert, Crystal Lake, will build a 1-story, 82 x 90-ft. garage here. Estimated cost, $40,000.

Ill., Joliet—The Public Service Co. has awarded the contract for the construction of a 1-story, 60 x 100-ft. garage. Estimated cost, $40,000. Noted Oct. 27.

Ill., Wheaton—F. E. Wheaton & Sons are having plans prepared for the construction of a 1 story, 66 x 101 ft. garage. Estimated cost, $55,000. L. M. Mitchell, 138 North La Salle St., Chicago, Archt.

The Weekly Price Guide

This Week's Market

Structural steel shapes, plates and bars are quoted at the Pittsburgh mills at $1.50@$1.65 per 100 lb. No change has occurred in the price of steel shapes during the week but plates and bars show a tendency to adhere to $1.50@$1.65 as against last week's price of $1.60@$1.65 per 100 lb. Weaker mill prices have not as yet been reflected in the warehouse quotations. Mill shipments, New York, of shapes and plates are quoted at $1.88@$2.03; bars at $1.80@$1.88 per 100 lb.

Electrolytic copper is quoted in the New York warehouses at 13⅝c. as against 13¾c. and tin at 28½c. as against 28¾c. per lb. Long terne plate has advanced slightly in Chicago. Lineseed oil has dropped 1c. in New York and 5c. per gal. (5 bbl. lots) in Chicago.

We are quoting this week for the first time prices on cutting and lubricating oils, belting and various forms of abrasive materials. These quotations are to the machine shops in quantities customarily used.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$24.50
Northern Basic	22.52
Southern Ohio No. 2	23.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	30.26
BIRMINGHAM	
No. 2 Foundry	20.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	22.75
Virginia No. 2	28.74
Basic	20.75
Grey Forge	21.75
CHICAGO	
No. 2 Foundry local	22.70
No. 2 Foundry, Southern, sil 2.25@2.75	26.66
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	22.96
Basic	21.96
Bessemer	21.96

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.50	3.28	3.10	3.38
No. 12	2.55	3.33	3.15	3.45
No. 14	2.60	3.38	3.20	3.48
No. 16	2.80	3.48	3.30	3.58
Black				
Nos. 17 and 21	2.85	4.05	3.55	3.95
Nos. 22 and 24	2.90	4.10	3.60	4.00
Nos. 25 and 26	2.95	4.15	3.65	4.05
No. 28	3.00	4.25	3.75	4.15
Galvanized				
Nos. 10 and 11	3.00	4.25	3.75	4.15
Nos. 12 and 14	3.10	4.35	3.85	4.25
Nos. 17 and 21	3.40	4.65	4.15	4.55
Nos. 22 and 24	3.55	4.80	4.30	4.70
No. 26	3.70	4.95	4.55	4.85
No. 28	4.00	5.25	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the Pittsburgh basing card of Sept. 16, 1921:

BUTT WELD

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
1 to 3	68½	56	¾ to 1½	44½	29½
LAP WELD					
2	61½	49	2	39½	25½
2½ to 6	65½	53	2½ to 4	42½	29½
7 to 8	62½	49	4½ to 6	42½	29½
9 to 12	62½	49	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	66½	55	1 to 1½	44½	30½
2 to 3	68½	56			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	59½	48	2	40½	27½
2½ to 4	63½	52	2½ to 4	43½	31½
4½ to 6	62½	51	4½ to 6	42½	30½
7 to 8	58½	45	7 to 8	35½	23½
9 to 12	52½	39	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	60%	46%	60½%	47½%	60%	46%
3½ to 6 in. steel lap welded	51%	37%	58½%	44½%	57%	43%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 5%. Cast iron, standard sizes, 32% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	5.00	6.00	*3.78
Spring steel (light) (base)	6.00	6.00	*2.93
Coppered Bessemer rods (base)	8.00	8.00	*6.03
Hoop steel	3.88	3.29	3.48
Cold rolled strip steel	7.50	8.25	6.75
Floor plates	4.85	....	5.23
Cold finished shafting or screw	3.88	3.50	3.83
Cold finished flats, squares	4.38	4.00	4.35
Structural shapes (base)	2.88	2.74	2.88
Soft steel bars (base)	2.78	2.64	2.78
Soft steel bar shapes (base)	2.78	2.64	2.78
Soft steel bands (base)	3.43	....	3.48
Tank plates (base)	2.88	2.92½	2.88
Bar iron (2.15@2.25)	2.78	3.52	2.78
Drill rod (from list)	55@60%	55%	50%

Electric welding wire ..... New York ⅜, 8½c. per lb.; ¼, 7.15c.; 5/32 to ¼, 6.75c. Swedish iron sells at 9c. per lb. in Chicago. *Price to dealers.

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York			13.62½
Tin, 5-ton lots, New York			28.50
Lead (up to carlots), St. Louis, 4.60; New York			5.00
Zinc (up to carlots), St. Louis, 4.97½; New York			5.37½
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.00	20.00	20.00
Antimony (Chinese), ton spot	5.50	6.50	6.00
Copper sheets, base	20.75	21.50	22.50
Copper wire (carlots)	16.50	16.50	15.75
Copper bars (ton lots)	19.00	23.00	19.00
Copper tubing (100-lb. lots)	20.50	23.00	22.50
Brass sheets (100-lb. lots)	16.25	17.00	18.25
Brass tubing (100-lb. lots)	18.00	19.00	20.00
Brass rods (1,000-lb. lots)	14.25	16.00	15.25
Zinc sheets (casks), (8% dis. carlots)	11.00	11.15	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (case lots)	19.50	23.50	18.00
Babbitt metal (best grade)	70.00	39.00	34.00
Babbitt metal (commercial)	30.00	13.50	8.00

—Shop Materials and Supplies

MONEL METAL—Base price in cents per lb., f.o.b. Bayonne, N.J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.50	10.25
Copper, heavy, and wire	9.50	10.50	9.50
Copper, light, and bottoms	8.00	8.00	8.25
Lead, heavy	4.00	3.75	3.75
Lead, tea	3.00	2.75	3.00
Brass, heavy	6.50	6.00	8.00
Brass, light	5.00	4.00	4.75
No. 1 yellow brass turnings	5.25	4.50	5.25
Zinc	3.00	2.00	2.75

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	21.50	.....	.....
IX,	20x28, 112 sheets	24.00	.....	.....
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	18.50	.....	.....
IX,	20x28, 112 sheets	21.50	.....	.....
Coke Plates, Bright				
Prime, 20x28 in.:			(56 sheets)	
100-lb.,	112 sheets	14.00	6.50	7.25
IC,	112 sheets	14.30	6.65	7.40
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.50	6.25	7.25
IC,	14x20	7.75	6.50	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.10
Wiping cloths per M., 13¼x13¼	.....	55.00	55.00
Wiping cloths per M., 13¼x20½	.....	65.00	65.00
Sal soda, 100 lbs	2.10	3.00	2.65
Roll sulphur, 2-bbl. lots per 100 lb	2.55	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.72	.80	.72
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per ton	$3.25@3.50	
Coke, prompt foundry, Connellsville	per ton	4.25@4.75	

SHOP SUPPLIES

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	—50%	—60%	60%
1½ and 1¼x3 in. up to 12 in	—40%	60–10–10%	—55%
With cold punched sq. nuts	—30%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	—40%	.....	$3.25 off
Button head bolts, with hex. nuts	—20%	$3.90 base	.....
Hex. head and hex. nut bolts	—20%	.....	.....
Lag screws, coach screws	—50–10%	.....	60%
Carriage bolts, all sizes up to 1 in. x 30 in.	—45%	50–10–10%	50–5%
Bolt ends, with hot pressed nuts	—50%	.....	55%
Tap bolts, hex. heads	—20%	.....	.....
Semi-finished nuts all sizes	—70%	75%	80%
Case-hardened nuts	—60%	.....	.....
Washers, cast iron, ½ in., per 100 lb	$5.00	$5.50 off	$4.50
Washers, cast iron, ⅝ in. per 100 lb	4.25	3.75 off	4.50
Washers, round plate, off list per 100 lb.	3.00	.... off	4.50
Nuts, hot pressed, sq	Off list	2.00	3.00	3.25
Nuts, hot pressed, hex	Off list	2.00	3.00	3.25
Nuts, cold punched, sq	Off list	1.50	3.00	3.25
Nuts, cold punched, hex	Off list	1.50	3.00	3.25
Rivets:				
Rivets, 7/16 in. dia. and smaller	50-10%	60-10-10%	–60-10%
Rivets, tinned	–50-10%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb	$3.70	3.50	3.68
Cone heads, ditto	3.80	3.60	3.78
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅞ in. diameter ..... *EXTRA*	0.15	.....	0.15
½ in. diameter ..... *EXTRA*	0.50	.....	0.50
1 in. long, and shorter ..... *EXTRA*	0.50	.....	0.50
Longer than 5 in ..... *EXTRA*	0.25	.....	0.25
Less than 200 lb ..... *EXTRA*	0.50	.....	0.50
Countersunk heads ..... *EXTRA*	0.35	.....	428 base
Copper rivets	50–10%	40–10%	50–10%
Copper burs	25–10%	15%	10%
Lard oil, pure, (50 gal. bbl.) per gal.	0.95	.....	.....
Lard cutting oil (50 gal. bbl.) per gal.	0.60	.....	.....
Machine oil, lubricating, per gal.	0.35	.....	.....
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50–5%	.....	8 in. standard
Medium grade	45%	.....	50–5%
Heavy grade	40%	.....	.....
Rubber and duck:			
First grade	50–10%	....	Standard
Second grade	60–5%	.....	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$9.00 less 20-10-5%		....20–10%
Emery paper	11.00 less 20%	.....	–20%
Emery cloth	32.75 less 10%	.....	–10%
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll, $4.50 net		.....	list+10%
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	$1.65 less 20%	.....	–10%
Cloth	$3.55 less 10%	.....	–10%

O., Cleveland — Richmond Bros. have awarded the contract for the construction of a 1 story, 66 x 90 ft. garage at 1600 East 55th St. Estimated cost, $40,000. Noted. Oct. 27.

O., Cleveland — J. M. Sands, Sweeney Ave. (manufacturer of water heaters), has had plans prepared for the construction of a 1 story, 37 x 100 ft. forge shop at 10300 Harvard Ave. Estimated cost, $40,000. Private plans.

O., Cleveland—Sobul & Elder; 416 Guardian Bldg., have awarded the contract for the construction of a 1 story, 100 x 100 ft. garage at 2719 East 55th St. Estimated cost, $50,000. Noted Oct. 6.

O., Cleveland—G. A. Vyse, 8816 Harkness Rd., has had plans prepared for the construction of a 2 story, 34 x 64 ft. garage at 8816 Harkness Rd. Estimated cost, $40,000. Private plans.

O., Findlay—The Glenwood Motor Car Co., c/o B. J. Cline, East 71st St. and Euclid Ave., is receiving bids for the construction of a 1 story, 100 x 700 ft. auto factory. Estimated cost, $250,000. Private plans.

O., Dayton—W. D. Huber, 209 North Main St, plans to construct a 3-story, 120 x 200-ft. garage and business building on West 4th St. Estimated cost, $175,000. Architect not selected.

Wis., Drummond—The Drummond Garage Co. has awarded the contract for the construction of a 2 story, 60 x 60 ft. garage and repair shop on Main St. Estimated cost, $42,000.

Wis., Eagle River—J. B. Cook is receiving bids for the construction of a 1-story, 50 x 50-ft. machine and forge shop. Estimated cost, $45,000. Private plans.

Wis., Eagle River—V. Krefl Mfg. Co. has awarded the contract for the construction of a 3-story, 60 x 85-ft. factory on Main St., for the manufacture of auto accessories. Estimated cost, $50,000.

Wis., Hingham—Eernisse & Co. is having plans prepared for the construction of a 2-story, 60 x 110-ft. garage. Estimated cost, $40,000. Private plans.

Wis., Madison—T. Roster & Co., 440 Clemens St., has awarded the contract for the construction of a 1-story, 50 x 60-ft. machine shop. Estimated cost, $40,000.

Wis., Milwaukee—J. Auchter, 1062 11th St., has awarded the contract for the construction of a 1-story, 90 x 122-ft. garage on Oakland Ave. Estimated cost, $40,000.

Wis., Milwaukee—S. Bodner, 546 4th St., has awarded the contract for the construction of a 1-story, 62 x 154-ft. garage on 4th St. Estimated cost, $40,000.

Wis., Milwaukee — H. and R. Larsen, Columbia Ave., have awarded the contract for the construction of a 1 story, 40 x 120 ft. garage on Fond du Lac Ave. Estimated cost, $40,000.

Wis., Milwaukee—J. Wellaeger Co., 417 Wells St., has awarded the contract for the construction of a 4 story, 90 x 120 ft. garage on Grand Ave. Estimated cost, $100,000. Noted Oct. 6.

Wis., Oshkosh—Fonte & Slater Co., 118 Main St., has awarded the contract for the construction of a 1-story, 61 x 87-ft. garage on Main St. Estimated cost, $45,000.

WEST OF THE MISSISSIPPI

Ark., Gravette—T. A. Wisdom plans to build a 1 story, foundry and machine shop on Main St. Estimated cost, $40,000. Architect not selected.

Kan., Council Groves—E. A. Roberts is having plans prepared for the construction of a 2-story, 50 x 87-ft. garage. Estimated cost, $45,000. C. W. Squires, Emporia, Archt.

Kan., Lawrence—The University of Kansas, c/o J. A. Kimball, Bus. Mgr., Topeka, has awarded the contract for the construction of a 2-story, 53 x 110-ft. electric laboratory. Estimated cost, $40,000.

Kan., Wichita—The Wichita Visible Pump Co., c/o E. P. Hayes, 701 Gilbert St., will build a 2-story factory for the manufacture of pumps. Estimated cost, $50,000. Noted Aug. 1.

Minn., Minneapolis—J. Cohen, 2015 Irving Ave., S. has awarded the contract for the construction of a 1-story, 132 x 158-ft. garage and store building on Nicollet Ave. and 14th St. Estimated cost, $60,000.

Minn., Minneapolis—The Murphy Transfer & Storage Co., Inc., 309 3rd Ave., N., plans to construct a 2-story, 70 x 160-ft. garage and office building on 4th St. and 9th Ave. Estimated cost, $40,000. Architest not selected.

Mo., Monett—The Missouri Holding Co., c/o J. Nelson, Secy., Broadway Hotel Bldg., plans to construct a 1 story factory on Main St. for the manufacture of dehydration machines. Estimated cost, $50,000. Architect not selected.

Mo., St. Joseph—The Grant Motor Co., 9th and Felix Sts., has awarded the contract for the construction of a 1-story, 120 x 140-ft. garage on 10th and Francis Sts. Estimated cost, $55,000. Noted Oct. 27.

Mo., St. Louis—The Chester Iron & Fdry. Co., 7800 Vulcan St., has awarded the contract for the construction of a 1-story, 45 x 117-ft. foundry. Estimated cost, $40,000. Noted Oct. 27.

Mo., St. Louis—J. E. Dougherty, 127 Blow Ave., is having plans prepared for the construction of a 2-story, 50 x 117-ft. garage on 39th St. and McRee Ave. Estimated cost, $45,000. Architects name withheld.

Mo., St. Louis—B. Gustavson will build a 1 story, 41 x 175 ft. garage at 1538 Tower Grove Ave. Estimated cost, $45,000. Noted Oct. 27.

Mo., St. Louis—The White Co., c/o W. C. Capen, Mgr., 3442 Lindell St, is having plans prepared for the construction of a 1-story service station on Leclede and Vanderventer Sts. Estimated cost, $75,000. P. J. Bradshaw, International Life Bldg., Archt.

Tex., Houston—The Missouri, Kansas & Texas R. R. Co., c/o E. L. Martin, Commerce and Market Sts., Dallas, has awarded the contract for the construction of a 1 story, 50 x 130 ft. machine shop here. Estimated cost, $35,000.

CANADA

Ont., Brockville—E. F. Phillips Electrical Wks., Ltd., DeGaspe St., Montreal, Que., manufacturer of copper electric wire and cable, plans to build main plant here to cost between $2,500,000 and $3,000,000. The company will commence work on first unit of plant (a rolling mill) within 4 months.

General Manufacturing

NEW ENGLAND STATES

Mass., Cambridge—J. W. Greer, 139 Main St., has awarded the contract for the construction of a 1-story, 63 x 80 ft. candy factory on Windsor St. Estimated cost, $25,000.

Mass., Springfield—The Springfield Ice Co., 47 Dwight St., has awarded the contract for the construction of a 1-story, 100 x 147-ft. ice plant.

R. I., Pawtucket—The Fisk Drug Co., 200 Main St., has awarded the contract for the construction of a 2-story, 60 x 90-ft. drug manufacturing plant on Main and Nashau Sts. Estimated cost, $40,000.

MIDDLE ATLANTIC STATES

Md., Frostburg—The Big Savage Brick Co., 40 West Union St., is having plans prepared for the construction of a brick plant. Estimated cost, $85,000. Private plans.

N. J., Trenton—The Acme Sanitary Pottery Co., May St., has awarded the contract for the construction of a 1- and 2-story pottery on May St. Estimated cost, $80,000.

Pa., Clarion—The Berney Bond Glass Co. has awarded the contract for the construction of a 1 story, 70 x 180 ft. glass factory. Estimated cost, $90,000.

Pa., Philadelphia—E. T. Biddle, c/o H. Biddle, 207 South 9th St., has awarded the contract for the construction of a 1-story, 22 x 139-ft. printing plant at 518 Locust St. Estimated cost. $15,000.

Pa., Pittsburgh—The Air Reduction Co., 342 Madison Ave., New York City, has awarded the contract for the construction of a 2-story acetylene plant on Ridge Ave., here. Estimated cost, $250,000. Noted Sept. 22.

SOUTHERN STATES

Fla., Vero—The Redstone Lumber & Supply Co. plans to rebuild its lumber mill which was destroyed by fire. Estimated cost, $26,000. B. T. Redstone, Mgr.

La., New Orleans—The Chalmette Oil & Refinery Co., 325 Camp St., plans to build a refinery including tanks, garage and distributing plant, in the square bounded by Virginia, Helena, Conti and St. Louis Sts. Estimated cost, $50,000. J. C. Copping, Gen. Mgr.

Va., Norfolk—The Anheuser Busch Co., Brooke Ave., has had plans prepared for altering and building an addition to its ice plant. Estimated cost, $250,000. Ophuls, Hill & McCreery, 112 West 42nd St., New York City, Archts. and Engrs.

MIDDLE WEST STATES

Ill., Chicago—Fox & Fox, Archts., 38 South Dearborn St. will soon receive bids for the construction of a 5 story, 50 x 142 ft. printing plant on Washington Blvd. and Elizabeth St., for the Bronson Canode Printing Co., 626 Federal St. Estimated cost, $150,000. Noted Oct. 20.

Ill., Chicago—Hetzel & Co., 739 Larrabee St., has awarded the contract for the construction of a 4-story, 54 x 72-ft. sausage factory at 1743 Larrabee St. Estimated cost, $85,000.

Ill., Mt. Morris—Kabel Bros. Co. is having plans prepared for the construction of a 1 story, 96 x 185 ft. printing shop. Estimated cost, $50,000. N. E. Buser, Mt. Morris, Archt.

Ill., Peoria—Leshnick Directory Co., 514 Main St., is having plans prepared for a 2-story, 50 x 150 ft. printing shop. Estimated cost, $100,000. B. L. Hulsebus, Jefferson Bldg., Archt.

O., Canton—The Continental Clay Co., Zinninger Bldg., is having plans prepared for the construction of a 1 story, 100 x 300 ft. sewer pipe factory in East Canton. About $300,000. Private plans. Noted Mar. 3.

O., Cleveland — The Federal Investment Co., c/o C. J. Hayes, 2882 Detroit Ave., has had plans prepared for the construction of a 3 story, 65 x 85 ft. addition to its knitting factory on West 29th St. and Detroit Ave. Estimated cost, $75,000. Christian, Schwarzenberg & Gaede, 1900 Euclid Ave., Archts.

Wis., Beaver Dam—Price & Ruland Co. has awarded the contract for the construction of a 2 story, 60 x 126 ft. factory for the manufacture of dairy products. Estimated cost, $45,000.

Wis., Milwaukee—The Amer. Hide & Leather Co., 1320 Elston St., Chicago, is having plans prepared for the construction of a 6-story tannery and power house on Commerce St. Estimated cost, including equipment, $1,000,000. Lockwood, Greene & Co., 60 Federal St., Boston, Mass., Archts. and Engrs. Noted Oct. 20

Wis., Milwaukee — The Milwaukee Bag Co., 206 South Water St., will build a 3 story, 30 x 40 ft. addition to its factory on South Water St. Estimated cost, $20,000.

Wis., Sheboygan—The Northern Furniture Co., South Water and New Jersey Sts., has awarded the contract for the construction of a 4-story, 50 x 100-ft. chair factory on South Water St. Estimated cost, $55,000.

Wis., Waukesha—The Manitowoc Church Furniture Co. will build a 1 story, 60 x 150 ft. factory. Estimated cost, $60,000 C. F. Schuetze, Mgr. Private plans. Noted Sept. 15.

Wis., Waupun—The Paramount Knitting Co. has awarded the contract for the construction of a 2-story, 53 x 182-ft. factory. Estimated cost, $100,000. Lockwood, Green & Co., South Dearborn St., Chicago, Ill., Engrs.

Kan., Wichita—The Wichita Ice & Storage Co., c/o C. W. Southward, Pres., 213 South Rock Island Ave., is having plans prepared for the construction of a 5 story, 75 x 90 ft. ice plant. Estimated cost, $200,000. G. E. Wells, Boatmen's Bank Bldg., St. Louis, Mo, Archt.

Mo., Ferguson—The Republic Photographic Co., c/o E. B. Fish, Pres., is having plans prepared for the construction of a 1 story, 55 x 385 ft. and 77 x 162 ft. factory. Estimated cost, $125,000. J. W. Gerhard, Boatman Bank Bldg., St. Louis, Archt.

CANADA

Ont., Bridgeport—The Buffalo Specialty Co., manufacturers of liquid veneer, plans to rebuild its plant which was destroyed by fire. Estimated loss, $75,000.

Ont., Petrolea—The Peninsular Sugar Co. is having plans prepared for the construction of a sugar refinery, 600 ton capacity. Estimated cost, $2,000,000. F. H. Hubbard, manager of Ohio Sugar Co., Ottawa, Ohio, Pres.

H. I., Honolulu—Loves Biscuit & Bread Co., is having plans prepared for the construction of a 5 story, 80 x 120 ft. biscuit factory. Estimated cost, $100,000. A. W. Hoffman, 730 Mashall St., Milwaukee, Wis., Engr.